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Ropes, Cords, &c.—S. Nicholls, 4417. W. R. Lake (com.), 4564.

Sewing and Embroidering.—O. L. Deschamps, 4319. W. R. Lake (com.), 4628. H. A. Dufrene (com.), 4638.

Ship and Boatbuilding.—S. Pitt (com.), 4374. W. Young, 4410. W. R. Lake (com.), 4415. H. Studer, 4669. T. McCarter and T. Cooper, 1670.

Ships' Boats (Lowering, &c.)—W. H. Watling, 4539. J. Darby, 4614.

Shirts, Collars, &c.—W. H. Cooper, 4358. C. Reuter, 4676. E. J. Payne, 4682.

Shot, Shell, Bullets, Cartridges, Percussion Caps, &c.—C. Pieper (com.), 4315.

Sifting, Sorting, and Separating.—W. J. Menzies, 4274. F. Thompson and W. H. Williamson, 4467. W. R. Lake (com.), 4494.

Signals, Alarms, Communicating Apparatus, Conveying Sounds.—C. W. E. Marsh, 4256. F. R. Francis, 4298. T. Wilkins, 4306. H. J. Haddan (com.), 4398. C. Kesseler (com.), 4585. W. Moseley, 4693. F. M. Rogers, 4613. J. White, 4708.

Spindles.—W. R. Lake (com.), 4294. R. J. Lines, 4566.

Spinning and Preparing for Spinning.—J. and J. Horrocks, 4278. C. A. Barlow (com.), 4291. J. C. Mewburn (com.), 4336. A. M. Clark (com.), 4375. W. Tatham and W. T. Heap, 4362. E. Pawson, 4384. E. and L. J. Crossley and W. Sutcliffe, 4468. C. Sipman, 4510. B. Hunt (com.), 4537. G. Little and T. C. Eastwood, 4545. G. Roper, 4556. C. D. Abel (com.), 4579. H. W. Whitehead and J. Stake, 4620. H. G. Hudson and G. Beaumont, 4631. G. Garside, 4672. T. Longfield, J. and T. Simms, and W. H. Sladdin, 4694. W. and T. Kitchen, 4703.

Stamps, &c.—G. E. Emerson, 4318.

Stays, Corsets, &c.—C. Rubens, 4311.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—W. Tully, 4273. J. Everding, 4333. S. C. Davidson, 4349. G. A. J. Weir, 4351. A. M. Clark (com.), 4416. C. G. Class (com.), 4449. T. B. Broadbelt, 4503. H. J. Harrison, 4517. T. Dale, 4586. G. Platts and F. Wood, 4605. W. Whitter, 4681.

Steam Engines (Stationary, Locomotive, and Marine).—G. and J. Weir, 4351. T. Hawthorn, 4369. W. Black and T. Hawthorn, 4434. D. Greig and T. Aveling, 4482. P. Jensen (com.), 4497. H. K. Shaw, 4581. W. F. Goodwin, 4674.

Telegraphs; Telegraph Printing Apparatus.—W. R. Lake (com.), 4400. J. H. Johnson (com.), 4440. J. T. King (com.), 4456. W. R. Lake (com.), 4572. C. D. Abel (com.), 4573. T. M. Roger, 4613.

Thrashing Machines, Reaping Machines.—W. Kaye, 4422.

Threads, &c.—W. R. Lake (com.), 4415.

Tilling and Cultivating, &c.—D. Greig and T. Aveling, 4482.

Tobacco and Snuff, Cigars, Cigar-holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco Pouches, &c.—J. Marinier, 4266. W. R. Lake (com.), 4012. J. T. Parlour, 4622. M. Brie, (com.), 4713.

Tramways and Tramway Carriages, Tramway Locomotives.—G. W. von Nawrocki (com.), 4279. J. H. Johnson (com.), 4388. J. R. Pursell, 4396. S. Nicholls, 4418. H. P. Holt and F. W. Crossley, 4499.

Traps for Drains.—T. J. Truss, 4280. D. Hutchison, 4643.

Umbrellas, Parasols, &c.—F. A. Ellis, 4457. A. J. Brown, 4511. T. Collier, 4529. F. A. Ellis, 4656.

Upholstery.—C. T. Hill, 4408. J. Watts, 4587.

Velocipedes, Bicycles, &c.—S. G. B. Wolluston, 4263. W. J. Fraser, 4458. S. T. Townsend, 4542. G. Illston, 4606. N. K. Husberg, 4660. S. Dorset and J. Walker, 4671.

Ventitation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—J. Fisher, 4419. A. M. Clark (com.), 4536. C. Ower, 4584. W. P. Buchan, 4717.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—P. Jensen (com.), 4359. S. Mason and J. Conlong, 4477. H. Illingworth, 4552. C. Harvey, 4578.

Waterclosets, Urinals, &c.—J. Wood, 4421. D. Hutchison, 4643. T. C. Matthews, 4661.

Weaving, Braiding, Plaiting, Preparing for Weaving.—J. Rawcliffe and J. Beardwell, 4268. J. Gray and J. Ingham, 4287. W. R. Lake (com.), 4376. T. Emmott, 4413. J. H. Openshaw, 4487. T. Greenwood, 4527. J. Bywater, W. Spurr, T. Spivey, and R. Smith, 4554. H. Portway, 4560.

Wheels for Carriages, &c.—R. R. Gubbins, 4465. J. Sharp, 4595. C. Kirk, 4641.

Winding Threads, &c.—C. Sipman, 4510.

*** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

DINNER OF THE QUEKETT MICROSCOPICAL CLUB.

The Quekett Microscopical Club held their third annual dinner on the 22nd ult., at the Holborn Restaurant, Mr. A. E. Durham, F.R.C.S., in the chair. Amongst those present were Dr. Cobbold (the president of the club), Prof. R. Jones, the Rev. R. Clifford, Mr. F. Crisp, Mr. C. Stewart, Mr. F. Burnand, Dr. M. C. Cook, Mr. J. E. Ingpen, Mr. F. Coles, and Mr. Hardy (Hackney Microscopical Club), and about 100 members of the Quekett. The chairman proposed "Prosperity to the Quekett Microscopical Club," and in doing so referred to its progress as evidence of a spreading interest in the use of the microscope and the study of its marvellous revelations. He believed that the microscope was capable of affording very valuable aid in the great work of education. The toast was drunk with enthusiasm. Mr. T. C. White proposed "the President," Dr. Cobbold responding. Mr. G. G. Hardingham proposed "the Royal Microscopical and Kindred Societies," and Mr. F. Crisp and Mr. C. Stewart responded for the Royal Microscopical, and Mr. E. Dadswell for the kindred societies. Dr. M. C. Cook, referring to the early days of the club in some very amusing anecdotes, proposed "the Chairman." The toast of "the Visitors" was responded to by Prof. R. Jones and Mr. F. Burnard. The latter made a very humorous speech, and said he had come prepared with a scientific address, but he found it would be out of place at such a pleasant gathering. "The Health of the Dinner Committee" (Mr. T. C. White, Mr. T. Curties, and Mr. J. W. Gooding, C.C.) was proposed by the chairman, who thanked those gentlemen for the arrangements they had made for such a pleasant evening. Some good songs were sung by Dr. Cobbold, Dr. M. C. Cook, and Messrs. H. Crouch and A. Cole. Mr. E. Winter White presided at the piano. The dinner was admirably served.

STEAM PAVEMENT RAMMER.

In a great city a solid, durable, and even pavement is very desirable, but it is seldom that a pavement is so well rammed by hand that it remains in good condition more than three years. The machine is designed to accomplish this kind of work by the power of steam. It is the invention of Mr. Samuel Johnson, of Philadelphia, Pa., and has been adopted by the Highway Department of that city, and extensively used in ramming the pavements, which are, it is said, as smooth as a floor, and the stones are so firmly set in the earth that the pavement will remain in good condition under heavy traffic for many years. The squares laid with this machine in the streets of Philadelphia present a striking contrast with the jagged and irregular pavements pounded by hand. The steam-rammed pavement is much smoother to travel over, and its noise is greatly diminished. Belgian blocks rammed by this machine form a solid floor of unyielding firmness.

The machine is self-propelling. The crane, which projects forward, carries a steam cylinder containing a reciprocating piston, the rod of which is attached to the rammer. The piston reciprocates in much the same way as a steam hammer, and its movements are controlled by the attendant, who also moves the crane from one side to the other.

Only two persons are required to work the machine, and it has a power to strike from one to twenty-two hundred pounds, while a man's labour cannot exert a force of much more than two hundred pounds. Then again the machine makes one hundred and sixty strokes per minute, while the strokes made by hand do not exceed twenty per minute. It will, further, do the work of ten men in the same space of time. This difference speaks volumes in favour of the steam rammer, throwing out of consideration the superiority of its work.

Running a Locomotive Without Fire, Water, or Steam.—An Amusing Incident in the Career of Mr. A. L. Holley.—While working as an engineer on one of the railways he made a wager with some of his fellows that he could run a locomotive a mile without fire, water, or steam, the locomotive to be taken empty and cold from the shop, and towed by another engine to a point at some distance on the road, where a level stretch of track favoured the experiment. Young Holley rode in solitary state on his cold locomotive to the scene of trial, and, unsuspected by his escort, so arranged matters that during the trip the motion of the drivers and pistons stored the boilers with compressed air. This gave him, by the time the destined point was reached, an accumulation of power by means of which he ran his mile and won his wager.—*Scientific American.*

A new paper, entitled *The British Emigration Journal*, is announced to appear on December 15th. It is intended to assist the emigration movement, and to furnish emigrants with trustworthy information regarding new fields for emigration.

Reviews.

*** In consequence of severe domestic affliction, the Editor has been unable to prepare reviews of works submitted for notice; hence they are postponed.

THE GOSPELLER ALMANACK.—We cannot do otherwise than commend this work to the notice of our readers.

NIGHT AND DAY.—We are glad to find that this interesting record of philanthropic work is progressing advantageously.

CHILDREN'S WORK.—A wonderful work has lately been done by children's hands—a work which will in all probability gladden the hearts and help to lighten the sufferings of many little weary ones in the children's hospitals throughout the country. Early in the present year the proprietors of *Little Folks* Magazine instituted a prize competition for coloured copies of the "Little Folks' Painting Book," the prominent feature of the scheme being that all the books were eventually to be distributed among the children's hospitals as a Christmas present from the young artists. In response to the invitation thus offered to the readers of *Little Folks*, hands and brains have been very busy for six months past, and during the closing days of the competition the number of books received by the editor has averaged as many as 500 copies a day, thus bringing up to many thousands the total number of painting books received. As a result, then, thousands of beautifully coloured books—more interesting than scrap books, as the pictures are accompanied by amusing letterpress—will be available for distribution among the children's hospitals. Notwithstanding that numerous prizes will be awarded to the competitors, only a small proportion can of course expect to be rewarded for their trouble, and it is satisfactory to think that so many children should have been content to devote many and many an hour throughout the year in the endeavour to provide amusement for their less fortunately situated brothers and sisters.

OUR LIBEL LAWS.

MR. MORTIMER, of the *Figaro*, has been condemned to one hundred pounds fine and imprisonment as a criminal because he somehow allowed his paper to be the vehicle of statements affecting the character of certain people mixed up with a case of practical application of our lunacy laws, which laws, every sensible person will admit, ought to have public opinion continually and fully brought to bear on them. This sentence seems too severe, and therefore we trust that the petition for its mitigation will be well supported.

LEWIS' PATENT CHEQUES FOR PREVENTING FRAUD.—The inventor of this system is Mr. John Lewis, F.S.S., Accountant, Waterloo Chambers, Temple Row West, Birmingham. A very simple, and at the same time very ingenious plan for preventing cheque frauds has been devised by Mr. John Lewis, of Birmingham. The simplest is for the use of private gentlemen. . . . In this the face of the cheque bears two notices, "under 30" and "unlimited" . . . . The notices are both printed and watermarked in the paper for additional security. In the case of crossed cheques a marked corner is to be removed. This, which is the simplest model, obviously limits considerably the extents of frauds possible by the addition of figures to those originally placed on the form, and it is clear that a further development of the same system would prevent them altogether. The sample cheques before us, though they would not absolutely prevent fraud, would evidently very much diminish its extent, and by multiplying the number of notices and division lines the possibility of increasing the amount drawn for could be altogether prevented.

Correspondence.

CHINA GRASS OR RHEEA COMPETITION.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

SIR,—As you are aware the Government of India offered a prize of £5,000 to the inventor or discoverer of the best machine or process which would separate the bark and fibre from the stem, and the fibre from the bark of the Bohmeria Nivea-Rheea, Ramie, or China grass plant. The conditions of the competition being the total cost should not exceed £15 for the ton of fibre, and the fibre should be worth at least £45 in the English market. The last notification was dated Simla, August 31st, 1877, for the trials to take place on the 15th August, 1879; this was postponed to 15th September, no less than 24 persons from America, France, Holland, England, and India, signified their intention of competing for this tempting prize of £5,000, which also carries with it pecuniary advantages worth at the least £20,000, so far as India alone is concerned, not including the great value of such an invention to the fortunate competitor who wins the prize as regards patents for other countries where the Rheea grows luxuriantly, as in certain portions of the United States, especially in California, in the south of France and Algeria, &c.

On the 15th of September, the day appointed. ten *bona fide* competitors made their appearance at the Government Botanical Gardens of this place. A large shed was in progress of erection with shafting and two portable engines of 6-horse power on my arrival here on the 15th September. This not being ready the trials were postponed until the 22nd, when most of the competitors were ready. The committee appointed by the Government of India consisted of E. C. Buck, Esq., President, Angus Campbell, Esq., Government Engineer, W. Duff Bruce, Esq., Government Engineer, and Dr. Murray Thomson, Professor of Chemistry at the Thomason College, Roorkee. A more competent and painstaking committee could not have been chosen; they observed the most rigid impartiality towards all, and strictly attended to the rules laid down to be observed by the competitors, and saw that they were not infringed on in any manner. I will, in brief, attempt the description of the machines or processes adopted by the ten competitors, whose names I do not mention as I wish to report the trials fairly and truthfully, without the least prejudice:—

No. 1 conceived the idea that by using brushes composed of the kaska grass he could remove the bark from the stems of the rheea. He accordingly had a large wooden machine made with rollers covered with this grass. The construction of the machine had been entrusted to a native mechanician who had not made mechanics his study, for the said machine could not be got to work, so the competitor retired from the contest.

No. 2 was also a large-sized wooden machine made by some native carpenter. The competitor had the notion that the rheea stems were of one size, which, not being the case, the machine could not be made to operate. So he also was forced to relinquish the position of being a competitor. This machine was a compound of wooden rollers and scrapers.

No. 3 had himself carefully housed in on all sides. It seems he employed some dozen coolies to beat the stems with mallets, much in the same fashion as boys in England beat willow stems to make whistles. After being well beaten the bark and fibre was peeled off, dried, and combed. Of course this was not only slow, costly, but the loss of fibre in waste per ton was very great, and the fibre was but imperfectly cleaned off the bark. The whole product of fibre was not over 4 per cent., or 90 lbs. to the ton of stems supplied by the committee to operate on.

No. 4 unpacked and put together one of the most beautifully constructed pieces of machinery it is possible to imagine. It was made by the celebrated firm of Lawson and Sons, Leeds. As to workmanship it was perfection. It consisted of brass rollers, corrugated iron rollers, India rubber rollers, and a host of appliances, to give every conceivable motion, up and down, backwards and forwards, sliding, rubbing, &c. This machine of large dimensions never cost the competitor less than £350, besides its great weight. Of course it did not work, and the competitor retired, or withdrew from the trials.

No. 5 brought any amount of apparatus on a large scale; large kettles, pots, pans, rollers, and fanners. He made a wonderful secret of his process, which, according to his own account, was to produce fibre worth £160 the ton. He was one of the first to commence operations, and had his portion of rheea stems weighed out to him. Time went on, and no fibre was produced. After some ten days had elapsed it was truly the old story of the mountain in labour which brought forth a mouse. I do not expect he saved over 2½ per cent. of fibre.

No. 6 it seems borrowed an old flax breaker, through which he passed the stems and crushed them up and in this state put them into a large boiler with the alkali of the country, and boiled them for several hours. On the conclusion of the operation a mass of fibre, mixed with bark, was exhibited and put out to dry. Failure was complete.

No. 7. This competitor lives in India, and came here some eight years since on purpose to grow the rheea plant. He had invented a machine composed of rollers furnished with knives, with India rubber—that is, the knives were on an India rubber covering of the rollers. This machine did most certainly a large quantity, that is at the rate of 12 per cent. an hour, but the quality did not support the quantity. The knives, of course, tore and dragged away a large percentage of fibre as waste. Besides, after drying this condition, it had to *be scutched*, which again diminished the amount of fibre, so that in the end perhaps 4½ per cent. of indifferent fibre was produced. This competitor had brought with him some dozen trained hands, and expected to have carried all before him.

No. 8. A droll combination of ingenious ideas misapplied.

No. 9. This person brought a large barrel, into which he placed the stems, and steamed them for some three hours; he then employed coolies to peel, beat, wash, dry, and rebeat them. A process not effective in either saving of fibre or producing a good quality.

No. 10. This competitor brought two machines; the larger one on being unpacked was found to be so broken as to be useless. The smaller machine, a hand flax breaker, of his invention in 1869, for which, and a large machine of the same construction, he has had awarded five gold and four silver medals in Ireland, France, Belgium, Russia, and Austria. This small machine was made to work by steam power, and the result was that over 3 cwt. of fibre was passed through the hour. In 15 hours the whole process was finished, and the ton of rheea stems yielded 147 lbs. of clear fibre, or over 6 6-10ths per cent. This result astonished every one, and seems to solve the long sought problem of economically and simply treating the rheea plant so as to obtain the fibre free from all extraneous matters.

The *whole* cost, it is asserted, of producing a ton of fibre will not be over £10, and the cost of cultivation £8, worth in the English market £60 to £70 the ton.

The Government of India on receiving the report of the committee will send the samples of the various competitors to England to be valued. On receiving their valuation, and, together with the report of the committee, the prize will be announced as to the successful competitor. This is not expected much before the middle of January, 1880.—I am, &c.,

R. H. C.

Saharunpur, N.W. Provinces, India,
Oct. 31st, 1879.

THOUGHTS ON A BIRTHDAY.

TIME flies, uninterrupted in its ceaseless pace,
And carries all before it, in its firm embrace;
Alike regarding not the youth nor age of men,
While only few exceed the three score years and ten.
Our birthdays, as the messengers of Time come round,
Reminding us that here no resting-place is found;
And hence our aim and object in this world should be
To educate ourselves for vast eternity.

Life's journey here on earth leaves prints along the road,
In each are marks to show the way the river flowed;
There is the milestone of some great and glorious deed,
The noble act of one raised up in time of need;
And hearts meanwhile in grateful joy must glow,
In foretaste sweet of Heaven on our earth below.
But there are many other milestones on the way,
Some quiet deeds which scarce e'en see the light of day.

Yet these are never lost, for goodness lives on high,
And—good or bad—we know our actions cannot die.
For some the opportunities are deep and wide;
Those lives are bounded by an ever flowing tide
Of that true charity which seeks the good of all
(With wisdom joined, for blinded love may sometimes fall).
In this great world there's surely work for all who will,
And each, however lowly, has a niche to fill.

In vain we grieve for those who leave their work undone,
Who strive "against the pricks," while endless ages run.
But fearful though it is on all around to see
Injustice and untruth, foul vice, and cruelty.
'Tis that should strengthen us in doing all we can,
Instead of mourning idly o'er the sins of man.
The greatest joy is when our hearts can truly say
As each year comes we've made some progress on the way.

A. B.

September, 1879.

AN OCTOPLEX PRINTING TELEGRAPH.—Prof. Klinkerfues, the director of the Gottingen Observatory, has, it is said, taken out a patent for a new invention in telegraphy. The professor has discovered a method by which up to eight different messages may be sent simultaneously by the same wire, an apparatus at the receiving end printing the messages separately and all at the same time.

RECENT AMERICAN AND FOREIGN PATENTS.

MR. ADAM HANCOCK, of St. Alban's, West Va., has invented an improved feed cutter, which consists of a rectangular box, open at the top and rear, and having a vertically movable front, whose lower edge is furnished with an inclined cutting blade. A lever, one end of which is fast in a rocking shaft fixed between the sides of the box, projects through a central opening in the movable front, and is the medium through which the device is operated.

Messrs. James P. Hall and Henry Jacobsen, of Niantic, Ill., have patented an improvement in check row planters; the rotating marker wheels vibrate the seed slide at the same time that the wheels are free to oscillate and follow the inequalities of the surface of the soil.

An improved check rower, to be attached to corn and other seed planters, has been patented by Messrs. Robert H. and William A. McNair, of Elsah, Ill. This invention consists of two spiders pivoted to a frame eccentrically in relation to each other, and carrying between them spades, which are always kept in a vertical position as they are carried around by the spiders.

Mr. Hiram S. Smith, of Austin, Minn., has patented an improvement in harrows, which consists in a beam and tooth fastening for harrows, formed of two straight parallel bars and two or more socket bands, which latter serve the double purpose of securing the bars together and clamping the teeth between them, so as to permit their adjustment wider apart or closer together, as may be desired.

Mr. David Smith, of Boston, Mass., has patented an improvement in urine-guards for water-closet seats. The guard is preferably made of glass or glazed earthenware or other material which will not absorb moisture.

Messrs. T. R. Gibson and M. F. Seeley, of Fremont, Neb., have patented an apparatus to be applied directly to the car wheel for the purpose of starting the car. It consists of a lever having fixed at one end a hook, which serves as a fulcrum, and near the same end a long hook which is pivoted on the lever.

Mr. John C. Montgomery, of Palmetto, Tenn., has invented an improvement in water wheels and gates, which consists in a water wheel composed of a hub having a flat upper side, a convex lower side, a peripheral ring, made of greater depth than the hub, and curving under it, so as to be of less diameter at the bottom than at the top, and a series of interposed curved buckets, which receive water at the top and discharge the same downwardly and inwardly to the centre of the wheel.

Mr. George Cooper, of Augusta, Ga., has invented an improvement in cotton and hay presses, which relates to the combination of an engine and valve reversing gear with the follower of a press and the mechanism for operating the follower; also, to the employment of an automatic stop motion in connection with the engine and follower.

Mr. Absalom W. Cain, of Harrisburg, Ill., has invented a novel and apparently effective car coupler, which will permit the uncoupling of the cars from their tops, so that all the risk to life and limb that is incident to the ordinary methods of coupling or uncoupling by going between the cars is obviated.

Mr. Augustus M. Coburn, of Watkins, N.Y., has patented an exhibitor, by means of which a large number of samples of paper hangings, oil cloth, carpets, and like materials can be readily and clearly exhibited without handling them and without occupying much space. The invention consists in an arrangement of a rotating drum containing a number of sections, to which the samples of paper, oil cloth, &c., are fastened, and a small wheel, covered with or made of rubber, leather, or sandpaper, or like material which rotates on an axis above the drum, so that when the small wheel is turned it pushes down one sheet after the other of the material that is to be exhibited.

Mr. Farnham M. Lyte, of Savile Row, county of Middlesex, England, has patented an improvement in the process of separating metals from ores containing lead, zinc, silver, and copper. It is designed to effect the neutralisation of the soluble bases, to economise acid, and to carry over the least possible quantity of silver and lead. The improvement consists in treating the raw ores with an acid solution partially saturated by previous attack on the ores, and treating the partially exhausted ore with acid before the latter is admitted to the raw ore, these steps being conducted in a continuous, alternate, and methodical manner.

Mr. Hermann A. J. Rieckert, of New York city, has patented an article of furniture combining a dressing-case and bedstead in such form that the bed may be folded and concealed when not required for use, and so that when turned down as a bed the use of the drawers and other conveniences of the dsessing-case is not prevented.

Mr. Tyree Rhodes, of Wales Station, Tenn., has patented an improved gate which is claimed to be more simple in construction, and of greater strength and durability than others now in use. It consists in a gate provided with an X-brace at its rear end to avoid the disadvantages of a mortised post.

Messrs. Richard C. Clark and Jacob A. Pearce, of Frankfort, Ind., have invented an improved bin for potatoes, apples, coal, and other articles usually kept in bulk, and removed for use or sale by scoops or shovels, or by hand. The object of the invention is to save the waste and trouble resulting from the use of bins or other receptacles that require the use of shovels to remove the contents, and also to screen the dust and dirt out of the potatoes or other vegetables at the time they are delivered.

An improvement in latches, patented by Mr. Joseph R. Payson, of Chicago, Ill., consists in a lever having a curved shoulder, in combination with a rose having a square orifice, and in combining with the latch bolt a latch lever having a curved shoulder, pivoted in the rose, and provided with a handle.

Messrs. Julian A. Chase and Preserved W. Arnold, of Pawtucket, R I., have patented a coffee urn with several compartments, and having a reversible stand, by which it can be held in position for use on the table, or adapted to sit directly on the stove or fire, as may be desired. It has a reversible stand pivoted to the urn, and adapted to secure the urn in position for use on the table, and to be held up in a reversed position when the urn is placed on the stove or over the fire.

An improved milk pan has been patented by Mr. John G. Cherry, of Walker, Iowa. It consists of a pan adapted to be submerged in a vat of water, and provided with a cooling tube for cooling the milk from the centre as well as from outside of pan.

Mr. Nathaniel Sleeman, of Birmingham, Conn., has patented a gas burner provided with a governor for regulating and cutting off the flow of gas. This device is especially applicable to street lights or lamps; for by its use all the lights of a city may be almost simultaneously extinguished by simply removing for a few minutes the pressure of the gas at the gas works. The same inventor has also patented another form of regulator adapted to gas supply pipes.

Mr. Charles Wm. Rice, of Columbus, Ohio, has invented an improvement in hot water heating apparatus, the object of which is to utilise the waste heat from open fireplaces in houses, for the purpose of heating other parts of the building. It consists in a fireplace having a grate, a water box, a flue, and a coil of pipes, the box being connected with radiators by circulating pipes.

An improved combined boiler and stove has been patented by Mr. David P. Allen and John A. Allen, of Briar Bluff, Ill. The object of this invention is to provide a boiler for supplying hot water or steam for heating and other domestic purposes, and combining with it, so as to utilise the heat from the water and from the furnace fire, baking ovens, and the ordinary parts of a cooking stove or range.

An improvement in weft-stop motions for looms has been patented by Mr. William Nuttall, of Westerly, R.I. This invention consists of a comb of wires combined with devices for raising it under the weft thread in front of the reed, and while the lathe is moving toward the cloth after the shuttle has passed, and while it is passing from one box to the other, and allowing it to drop down, so as not to interfere with the beating up of the weft by the reed. It also consists in a novel arrangement of devices by which, in case the weft thread is absent or broken, the loom will be stopped.

A simple and efficient apparatus for steaming dry or frozen wheat previous to grinding, has been patented by Mr. Jeremiah W. Champion, of Rocheport, Mo. It consists in the combination, with a pipe or tube through which the grain is passed, of an outer pipe or shell forming a steam space and screw plugs, whereby more or less steam may be admitted in contact with the wheat.

Mr. William J. Marble, of Wilmington, O., has invented a book case made in sections, and so constructed that the sections may be taken apart for convenience in moving and again put together without removing the books from their places.

An improved stove-pipe receiver has been patented by Mr. William Shaw, of Millbridge, Maine. The object of the invention is to enable a stove to be set up to any height of flue within the limit of the height of the room, and also to provide an arrangement to be used in connection with any stove-pipe hole that will admit of any sized pipe (of the sizes usually made by stove makers) being joined to the hole without trouble or inaccuracy.

Mr. Reinhold P. H. Koska, of East Saginaw, Mich., has patented a device for holding eggs while opening them. The invention consists of a pair of tongs, whose legs terminate in concavo-convex plates, that when closed together shall be in shape like an egg, with its upper third removed, so that when they are brought together they may embrace and cover the lower two-thirds of the egg.

Messrs. Henry W. Wilson and Alonzo Gandy, of Freeport, O., have patented an improved thill-coupling, which will allow the thills to be readily attached and detached, and which will prevent any noise or rattling when in use.

Mr. William R. Kitchen, of Willard, Ky., has patented an easily operated device for detaching the harness tugs from the ends of whiffle-trees, and it consists of a ferrule with projecting arms, in which is pivoted a crossbar with a pin which enters a hole in a lever pivoted below. The tug is released by moving the lever.

An improved apparatus for coating pills has been patented by Mr. Henry M. Dury, of Edgefield, Tenn. The object of the invention is to facilitate the operation of coating pills with gelatine and other fluid coating materials. It consists of a shallow circular dish or pan, in the bottom whereof are hemispherical indentations to receive the pills. In this pan works a plunger provided with projecting needles or points corresponding in number to the indentations. Sheathed over these needles or points there is a metal plate attached to a rod passing up through the handle, and held up so as to leave the needles unsheathed by a spring, the apparatus being adapted to take up the pills from the pan and hold them while they are being dipped into the coating material, and until they dry, after which they are forced from the needles by pressing the metal plate against them.

Mr. Johannes Schuhmacher, of Roemische Posel, Soernewitz bei Meissen, Koenigr Sachsen, Germany, has patented an improved process of producing collodion transfer pictures upon lining or other material, which consists in first washing with a solution of gelatine the surface that is to receive the picture, then flowing it with the collodion mixture described, and printing thereon from the negative, then finishing in the usual manner, then colouring and applying adhesive varnish, and then transferring the collodion picture film.

Mr. Thomas L. Rankin, of room 75, Astor House, New York, has recently secured several United States patents for improvements in ice making apparatus. We are informed that during recent trials of the apparatus, in this city, very satisfactory results were obtained. The apparatus, while it is capable of making ice economically, is intended more especially for direct refrigeration, and is especially adapted to the refrigeration of vessels, beer vaults, and cooling rooms of slaughter houses. It will be remembered that not long since Mr. Rankin produced a sheet of artificial ice covering the entire area of Gilmore's Gardens in this city, the largest artificial sheet of ice ever made. One of the novel inventions of Mr. Rankin is a cover for soda water fountains, which is shaped like icebergs and refrigerated to produce a coating of ice on their outer surfaces.

An improved self-adjusting relay has been patented by Peter S. Bates, of Bloomsburg, Pa. The object of this invention is to furnish relay instruments which shall be so constructed that the current passing through it will govern the spring of the armature, and cause it to adjust itself to the force of the current, whether the current be very strong or the weakest current that will pass over the line, rendering it unnecessary for the operator to touch the instrument.

Mr. Christopher C. Hackett, of Floyd, West Carroll Parish, La., has patented an improvement in digging and curbing wells which insures accuracy in the shape of the well and the direction of the digging; it also enables the two operations of digging and curbing to be proceeded with simultaneously, and protects the workman from falling bricks and the caving in of the well.

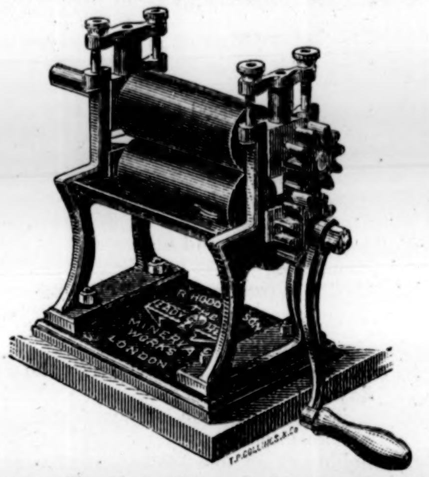
Mr. Nicholas C. N. Laurense, of Detroit, Mich., has invented an improvement in methods of mounting chromos, engravings, pictures, and the like, consisting of pasting a sheet of paper over the back of the chromo or picture, covering the outer surface of the paper with a paste or composition that will quickly set, and then pasting or gluing narrow strips of cloth on the back of the picture near the edges, and pasting or gluing them to the sides of the stretcher.

Messrs. Melvin A. Belcher and George F. Perrenot, of Rockport, Texas, have patented a manacle or shackle for the hands and feet, that will offer effectual resistance to any attempt to break them while on the hands or feet, and that will, when on the hands, prevent one from using any instrument for effecting his escape.

OBITUARY.—On 23rd ult., at her residence, 95, Talfourd-road, S.E., Emma Campin, the beloved sister of the Secretary of the Inventors' Institute, after a long and painful illness, departed this life, aged 67.

COWDERY'S IMPROVEMENTS IN KNIFE-CLEANING MACHINES.

THIS invention relates to certain improvements in machinery for cleaning knives, &c. The construction of the mechanical arrangement of this knife cleaner is as follows:—Upon a suitable bed is bolted or otherwise fixed two standards or cheeks slotted to receive bearings. Two bearings are made to freely slide up and down each slot, one above the other. The said bearings are made to receive the bearing parts of two rollers, covered for a certain part of their lengths with india rubber or other suitable material, and connected together at one end of them by suitable cogs. On the lower roller is fixed a suitable handle, by turning which in a circular direction gives motion to both rollers. Under the lower roller is fixed a suitable trough or hopper, which trough or hopper is filled with emery powder or other suitable material, the lower roller turning in the powder and the two rollers being close together. The lower one distributes the emery or other material upon the one above it. The knife in cleaning is one hand between the rollers, and the macnine is turned by the other hand. To allow for the difference of the thickness of knives, a suitable weight or spring is provided, which allows the top roller to move upwards, at the same time keeping a pressure upon the knife, &c.



THE YEAR BOOK OF BRITISH COMMERCE AND INDUSTRY.

FROM the prospectus of the above work, issued by Lucien Wolf, author of "Reminiscences of the Paris Exhibition," &c., we quote the following:—

"The end of the year is the period usually selected by all business men to balance their affairs—to take stock, to compare their assets with their liabilities, to put their books in order, and, in short, to ascertain the exact position they occupy pecuniarily. An intimate association with gentlemen engaged in many of the most important industries and trades of this country has, however, impressed upon me most forcibly that it is not only to the circumscribed affairs of their own warehouses that commercial men and manufacturers now confine their attention, but, as every day they find it forced upon their notice that they require to take a more extended view of the general horizon, they may be found studying such problems of statistics and economy as their fathers were in the habit of relegating to schools of philosophy or unconcernedly and uncritically entrusting to the arbiters of their destinies in Downing-street. Business men now study the *modus operandi* of their various occupations scientifically, inquire enegetically into the commercial influences of what were formerly considered extraneous matters, inform themselves thoroughly on questions which, although only affecting the economic world as a whole, experience has taught them are not unconnected with the minutest developments of individual branches of industry; in fact, the progress of science and politics in its bearing upon trade generally is eagerly scanned by modern merchants and manufacturers — scanned, digested, and acted upon. This is, therefore, a not inappropriate period to publish a Year Book for the commercial and industrial classes, which shall be at once a fitting exponent of their most advanced ideas and a guide and a work of reference in their less ambitiour routine labours."

BOILLOT'S OZONISER.

Its peculiar features are—1st. The use of gas-carbon as the material constituting the two poles; 2nd. The ozonised oxygen is allowed to flow through, and in contact with, one of these poles, instead of isolating the gas-carbon in a glass tube. The apparatus was constructed so as to embody the ideas of its author, as far as could be understood.

The oxygen was conveyed through a glass tube, 60 c.m. long and 15 m.m. in diameter. This was closed with paraffined corks at both ends, through which smaller glass tubes were passed for inlet and outflow of gas. It was filled with coarse fragments of gas-carbon, each about the size of a pea. These were connected with one pole by a copper wire passing through the cork. The middle of this tube was surrounded by another tube, 19 m.m. in diameter, the space between them being filled with pulverised gas-carbon, and connected by a copper wire with the other pole.

Results.—Length of spark, 60 m.m. at beginning, 50 m.m. at close of experiment; temp., 20°; time, two hours; amount of oxygen used, 4 1-3 litres; of ozone obtained, 11·91 m.grms. This is equivalent to 2·77 m.grms., or 1·29 c.c. per litre.

OPENING OF THE EXHIBITION AT SYDNEY, AUSTRALIA.

The ceremony of opening the Sydney International Exhibition was performed on the 17th of September, in beautiful weather, by Lord Augustus Loftus, the Governor of New South Wales. The day was observed as a public holiday, and the streets were densely crowded by the townspeople and visitors from all parts.

The proceedings began with a procession of the public bodies, who were followed by Lord Augustus Loftus, the Marquis of Normanby, Governor of Victoria; Sir W. F. D. Jervois, Governor of South Australia; Mr. Weld, Governor of Tasmania, with their respective staffs; the Colonial Ministers, and the military, naval, and civic authorities. The procession paraded the principal streets and reached the Exhibition at noon, where Lord Loftus performed the ceremony of unveiling the statue of Queen Victoria amid great enthusiasm. His Excellency then proceeded to the dais, which was surrounded by a brilliant assemblage, consisting of the commissioners of the foreign countries and of the Australian and other colonies which have sent exhibits to Sydney, the colonial members of Parliament, the clergy, judges, and others. The whole spectacle was of a most imposing character. After the choir had performed an inaugural cantata, the Sydney Commissioners presented an address to Lord Augustus Loftus, asking him to declare the Exhibition open. His Lordship, in replying to the address, congratulated the colony upon the success of its efforts to gather together in its capital a representation of the arts, and of the achievements of the industrial forces of the entire globe. The event, he said, was an epoch in Australian progress. After welcoming in appropriate terms the various foreign and colonial representatives, the Governor formally declared the Exhibition open. The announcement was received with the firing of salutes; and the choir sang the National Anthem.

The Colonial Governors were then conducted through all the courts of the Exhibition, and were introduced to the several foreign commissioners, who awaited their approach in the sections devoted to the exhibits of their respective countries. The whole ceremony was universally considered a great success. The concourse of people was immense. The main building, which is styled the Garden Palace, is much admired. The exhibits represent the products of England, almost all foreign countries, and the Australian and other colonies.

There is a gigantic display of agricultural implements. The machinery in motion department is on a great scale, and there is every reason to believe that this department will be of great interest and practical use. The pottery and glass section is very good and extensive. There are 800 British industrial exhibitions and 513 fine art entries, including photographs. Germany has 695 entries, including 108 fine art; Austria, 170; France, 350 industrial and 168 fine art; Belgium, 236 industrial and 50 paintings; America has 150 industrial collections. Among the best filled sections are railway apparatus and material, steel and cutlery from Sheffield, guns, and miscellaneous manufactures from Birmingham, Manchester goods, sewing cottons, cloths, hats, India-rubber manufactures, chemicals, preserved foods, lamps and stoves, paper and stationery.

PRITCHETT'S PATENT CELLULAR SYSTEM OF BUILDING.

This cellular system of building, exhibited at the Croydon Exhibition, we think contains many advantages: amongst others its sanitary advantages. Halls and floors, and other parts of buildings, can be kept pure and sweet by the air in the hollow pipes, and circulation of air can be established either for warming or cooling purposes.

Mortar, of which there is three tons weight in every rod of brickwork, is dispensed with. In a sanitary view this is very important, as mortar is too frequently composed of filthy sand and rubbish, and renders houses unhealthy. Also damp and wet more frequently penetrate buildings through the horizontal mortar-joints than through the bricks. In the patent cellular system this is obviated, as all pipes "break-joint," and are placed vertically.

For floors the system is very important in many respects. First, their fire resisting construction, as air can and will be admitted through the pipes so as to check heat; girders are protected from softening, as also upright pillars. Also this system has advantages through its lightness being not much more than half the weight of brickwork. For floors also, and partitions, sound is much checked through the air intervening in the pipes. In solid slate and concrete floors, and partitions, sounds are conducted very readily and unpleasantly from floor to ceiling, &c., but in the patent hollow tubular floors the reverse is the case, viz., conveyance of sound is checked.

For flat roofs this tubular system is good on account of its lightness, and its checking unequal expansion and contraction, as by the air passing through the pipes an uniform temperature of the several portions of the roof is maintained, which much checks damage to the flat from unequal expansion and contraction.

For paving on damp or made soils the system is very advantageous, as it keeps down damp and noxious and dangerous smells, air being admitted through the pipes. This advantage is obvious where basements have old and suspected drains under them, or where houses are built upon bad soils

Air can be introduced by means of the pipes to cure and assist badly drawing chimneys, and for supplying fresh air to, or for drawing off vitiated air, from rooms, workshops, or otherwise.

The cost of the patent cellular system is in favour of it as against brickwork.

The patent pipes can be manufactured in any part of England whereby the cost of carriage from distant places will be saved.

The saving of cost in conveyance, shiftings, and during use of the pipes is obvious on account of their lightness as compared with brickwork.

NEW AND OLD VIEWS ON THE NASCENT STATE OF BODIES.

Dr. T. L. Phipson, in a communication to the *Chemical News*, supplies the following noteworthy statement on this important subject:—

In my note on this subject, in the *Chemical News* (vol. xl., p. 184), I called attention to some statements by Prof. Tommasi published in that journal (vol. xl., p. 171). The author has since replied in an interesting paper (vol. xl., p. 245), and it is evident that our opinions on the nascent state of bodies are not quite so divergent as his first note led me to expect.

Many chemists will doubtless have been misled by the title of Dr. Tommasi's first note, "On the Non-Existence of Nascent Hydrogen;" but it appears by his second note that he admits its existence, for he says:—"The reductive power of nascent hydrogen varies according to the chemical reaction which produces it. And if this gas in the nascent state possesses greater affinity than in the natural state, it is solely due to the fact that the hydrogen, the moment it issues from a combination, is found to be accompanied by the whole quantity of heat produced during the setting free of the hydrogen." So that the author not only does not deny the existence of nascent hydrogen, but actually supports it by a theory of his own. This is all I contended for.

Dr. Tommasi hopes that I may accept his thermic theory. It is, perhaps, as good as another; but if the word heat, in the paragraph just quoted, be replaced by electricity, this thermic theory becomes identical with that published in 1858 in my "Force Catalytique, &c." (quoted in my previous note). Whether the thermic theory will explain such facts as those given on pages 29, 30, and 31 of my paper better than the electric theory still remains to be proved; whilst the paragraph on 34 of that work will convince him that I was occupied with this subject as early as 1857; that is, not only before Tommasi, but before Houzeau.

But by whatever theory these curious reactions may be explained, there can be no doubt that Dr. Tommasi has made known several new and very interesting facts concerning reductions operated by hydrogen; and he will be the last person not to see the identity of the reduction of auric chloride by hydrogen gas in presence of platinum, for instance, with the phenomena of hydrogen in the nascent state.

His argument that heat will produce the same result, when the temperature of the hydrogen gas is raised, is rather old,—it will also be found in my "Force Catalytique"—already quoted, but we may use the same argument and substitute the word "electricity."

After all, what is caloric? It is not a material substance that can be introduced into a body like raisins into a cake. The electric action can be put in evidence by the galvanometer more directly than the thermic condition can be rendered manifest by the calorimeter; and, as caloric and electricity are mutually convertible agencies, replacing each other equivalent for equivalent—as Grove and others have long since shown, it is no doubt difficult to admit that either one or the other is, in all cases, essentially the cause of the "nascent state" of bodies.

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Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

THE SESSION 1879—1880

Members' Meetings at 8.15 p.m. on Thursdays, December 11th; January 8th and 22nd; February 5th and 26th March 11th and 25th; April 8th and 22nd; May 6th; and June 3rd.

Annual General Meeting, Thursday, May 20th, at 4 p.m., unless otherwise arranged.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

EXECUTIVE COUNCIL.

AT the meeting on the 30th October, after confirmation of the minutes, the question was raised as to whether, in order to promote efficient action in regard to Patent Law amendment ,it would not be desirable to send a circular letter to Members of Parliament directing their attention to the Patent Laws as of great importance in regard to the prosperity of the country.

Admiral Selwyn handed in sketch of a letter, which was placed in the charge of the Secretary, in order that he might prepare a circular letter in accordance therewith.

The meeting of the 27th of November we cannot report at present.

Monthly Notices.

Tempered Glass.—M. de la Bastie describes in *Les Mondes* for October 9th some improvements in the methods of tempering glass. He exhibited at the Société d'Encouragement toughened glass mortars with their pestles for chemical use. The glass, it appears, is now plunged into oil while still at a red heat.

The Royal Society's Council for the coming year has been nominated. The election will be held on December 1st, at the anniversary meeting of the society, a day later than usual, in consequence of St. Andrew's Day falling on a Sunday. President, Dr. W. Spottiswoode; treasurer, Dr. J. Evans; secretaries, Prof. G. G. Stokes and Prof. T. H. Huxley; foreign secretary, Prof. A. W. Williamson; other members of the council, G. Busk, Prof. A. Cayley, Major-General H. Clerk, E. Dunkin, A. G. Vernon Harcourt, Sir J. D. Hooker, J. W. Hulke, Lieut.-General Sir H. Lefroy, W. Newmarch, Prof. A. Newton, Prof. W. Odling, Sir J. Paget, Bart., W. H. Perkin, C. W. Siemens, J. Simon, and Prof. J. Tyndall.

Prof. Ayrton had an audience of about 1,300 when he gave his inaugural address the other day for the City and Guilds of London Institute. As the fees are merely nominal the classes should be well attended.

Phenomena of Animal Economy.—M. Pasteur, in the *Journal de Pharmacie et de Chimie*, states that his experiments lead him to believe that in the animal economy phenomena take place of the same order as in fermentation. Oxygen acts not only in establishing and supporting combustion, but it gives to the cellules an activity whence they derive the power of action beyond the influence of free oxygen in the manner of the ferment cells in yeast.

The Royal Society Medals are awarded this year to two foreigners, the Copley medal to Prof. Rudolph J. E. Clausius, of Bonn, foreign member R.S., for investigations begun in 1850 on the mechanical theory of heat, its application to machinery, to the mechanical equivalent of heat, and to electricity. The discussion of these questions and that of "Molecular Motion called Heat" are included among the seventy-seven titles which appear under Prof. Clausius's name in the Catalogue of Scientific Papers. For having discovered the metal gallium, M. Lecoq de Boisbaudran, a well-known chemist, takes the Davy medal. Aluminium was known, and indium was known, but the unknown lay as a gap between them, and this has now been filled by the above-named investigator. We may add that gallium exists as a constituent of blende, and that its discovery and isolation were effected only after a laborious investigation, spectroscopic and chemical, of many varieties of the mineral. The royal medals, given by the Crown on the recommendation of the Council of the Royal Society, are adjudged to two Fellows on the home list, Prof. A. C. Ramsay, Director-General of the Ordnance Survey, and Mr. W. H. Perkin. The former has been connected with the Survey nearly forty years, during which time in addition to his official labours he has published works of repute on numerous subjects in geology and physical geology, and has won a recognised position. Among industrious and skilful workers in organic chemistry, Mr. Perkin stands conspicuous. His methods and results are placed on record in the *Journal of the Chemical Society* and other scientific publications, and mark him as the originator of one of the most important branches of chemical industry, namely, the manufacture of dyes from coal-tar derivatives, and as an original, accurate, and complete investigator. And to this we may add that he was never more zealous in his work than since circumstances have enabled him to give his undivided attention to science.—*Athenæum.*

Fireless Locomotives for Tramways.—M. Léon Francq, of Paris, brought before the Institution of Mechanical Engineers at Manchester on the 30th of October this subject. It deserves serious attention as bearing on the great questions of safety and health in towns. Essentially the fireless engine consists of a vessel holding water, heated by high-pressure steam, supplied from a stationary boiler, and it therefore becomes a reservoir of power which is sufficient for the required journey. These engines have been at work on the tramway between Rueil and Marly le Roi for some time.

French Railway Travelling.—The distance from Paris to Marseilles is 600 miles, and by a recent arrangement a train of the Paris, Lyons, and Mediterranean Railway makes this long journey in fifteen hours, leaving the capital at 8 a.m., and reaching the shores of the Mediterranean at 11 p.m., an average continuous speed of 40 miles per hour.

The Scientific Review
AND
SCIENTIFIC AND LITERARY REVIEW,
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

DECEMBER, 1879.

AGRICULTURAL IMPROVEMENT IN AMERICA.

EVERYBODY must have heard of agricultural depression; hence any proposition for the removal of such a national evil will be viewed with general approbation. We can conceive of nothing more likely to prevent the recurrence of depression than the pursuit of improvement on an efficient scale; therefore the grand experiment proposed to be tried in America is doubtless worthy of every attention. The Correspondent of the *Times* with the members of the Royal Agricultural Commission in America describes a series of operations on the heroic scale and marshalled form that we are accustomed to regard as the special attributes of war. Under an able commander-in-chief, with a well-selected staff, an army of men, horses, and mules, amply equipped, and supplied with all the resources of peaceful engineering, are waging war with the obstacles and asperities interposed by Nature in the way of those who would rifle her hidden stores. The area of this campaign is 75,000 acres, or 117 square miles, which is about the size of the county of Rutland. Our autumn manœuvres are generally content with a much smaller space; indeed, there would be quite room enough in it for a few hundred thousand men to be surrounded and captured, supposing the ground to be convenient and other circumstances favourable. It is modestly described as a farm, and we are invited to compare it with the bits of valley or hillside surrounding old-fashioned homesteads called farms in this country. It stands, however, at the same pre-eminence above the ordinary American farm, which seems to have retained the humble type received from the condition of the original settler. Casselton is in the Dakota territory, at the head of the Red River, which flows chiefly in the British territory. Mr. Oliver Dalrymple, who had elsewhere proved his capacity by reclaiming and cultivating with success 6,000 acres—the area of a large English parish—repeats that identical process every year at Casselton, and in seven or eight years more will have brought the whole 75,000 acres into good working order. It will then be simply a very large farm, easily under the eye and the orders of one manager; but it will remain to be seen whether the hands, the organisation, and the system suitable for the first process of gradual reclamation will be equally desirable for the permanent residence of an ordinary population. Nearly all the workpeople are sent into space at the approach of the long American winter, and recalled from it only when the frost has left the ground six inches deep. The men sleep in barracks, two in a bed, and are no doubt much better housed, fed, and cared for than our own labourers. But they are soldiers of agriculture, fighting a battle, and treated accordingly. The state of the country favours the arrangement. When the agricultural season ends, the lumber season commences, and work is never wanting, at least to a strong man who wants it and will look for it.

The gigantic scale of the operation allows well-digested system, arrangement and economy of labour, and, above all, that process which is so difficult in small, uncertain, and exceptional examples—viz., counting the cost. Surrounded by all kinds of operations, many having no direct view to profit, and tied by many expensive conditions, few gentlemen, or even farmers, in this country could say what anything really costs them. When twenty thousand acres have to be treated in the same way, under a certain number of superintendents, assistants, and workpeople, with the machinery found by experience to be adequate for the area, and all the other conditions of the problem reduced to equal certainty, it is then possible to state to a cent—that is, to a halfpenny—the annual cost of the land, the buildings, the machinery, the wages, and keep of the workpeople, the seed, and all the other items. The cost of every distinct operation, from the first ploughing to the despatch of the wheat to the market, or the port, can be estimated exactly. The scale itself forbids all those condescensions and weaknesses under which small managements are apt to bring down. The men are treated as human machines. The iron or steel machines for ploughing, harrowing, cutting, reaping, binding, thrashing, elevating, or what not, are kept in good working order. So are the men, who seem to be fed "like fighting cocks," and who have everything placed within reach, except that which is most fatal of all things to human and, indeed, material machinery, strong drink. On Sundays, it is stated, they are left to themselves, and then, it is added, do they most go wrong. It is the horses and mules that afford the most striking proof of the carefulness which is the real secret of this operation. We all know too well what happens at home in operations really involving no more necessary hardships to man and beast than the annual campaign in Dakota. Our autumn manœuvres do not last a fortnight, and the horses are then found reduced to a third of their value, and sold generally for less. At Casselton, on the contrary, out of the thousand or more horses and mules brought up from St. Louis only sixteen have been used up in four years, and even they are of some use. The statement seems incredible; but with ever so much discount, it still reflects severely on the results of English military management. In several other respects the colossal scale is favourable to economy. All the stock, living or dead, from the simple barrow to the locomotive steam engine for manifold purposes, from the tools to the waggons, are of the same pattern, and are obtained at wholesale prices from the same factories. Considered as a vast machine, a good many large establishments are associated with that at Casselton, interested in its credit and sharing its risks. As the business is one for profit, economy is indispensable. The vast surface under treatment is regarded as the floor of a workshop. Waggons loaded with the newly-cut corn roll up to the thrashing machine in regular order, and as regularly receive the wheat after it has been thrashed and carry it to the station, whence it is immediately despatched by train. All is by clockwork. No gaps are allowed, no arrears possible.

The first suggestion that will present itself to many minds is that this is a formidable spectacle. What is the British farmer to do, with his tremendous rent, rates, taxes, weakly labourers, large families, indifferent worked-out soil, small fields, hedgerows, birds, vermin, rain—indeed, all the elements arrayed against him? To this it may be replied shortly that, admirable as the operation is, and well worth a visit to Dakota, it is very exceptional in many respects, and need not be accepted as the proof of a ruinous competition to be encountered by our own farmers. The region itself, at the head of the Red River flowing into Hudson Bay, the Missouri flowing into the Gulf of Mexico, and divers streams flowing into the Atlantic, is unique. The soil is rich and virgin. It has not given in for four years; but how much longer will it retain its fertility when the dung is allowed to rot at the stables, and all the straw not wanted for litter is got rid of by burning it where it lies? An undertaking which depends on a supply of able-bodied and intelligent men, either without wife and children or content to leave them for agricultural operations a long way off half the year, and for the lumber trade the rest, must have its limits. Thus far Dakota appears happily exempt from any of the plagues which sorely beset the English farmer. Most of our vermin and our weeds are unknown in a region which for half the year is buried in frost and snow. But these will come in and multiply with cultivation. Then, though the seasons are more regular there than here, yet a drought, or a swarm of locusts, may destroy the whole crop, and with it all the profit of the year, and all that has been spent in the ground. Our own variable soil, weather, and circumstances give the farmer so many more chances, or "legs to stand upon." Of course he will never be able to do business on such a scale. It is very rare indeed that a hundred-acre wheat field is heard of in this country, and even then it is generally an exaggeration. Few people have seen twenty scythemen working in a row, or even harrows linked to a breadth of twenty feet and drawn by four horses. Our scale is small and will generally so remain; but American agriculture has its vicissitudes, with new reverses in the far horizon. Thirty-three years ago there was a general unanimity of the Protectionist prophets that for the future wheat would average 35s. a quarter. What is the fact? The average price for the last seven years has been considerably higher than it was for the seven years preceding the Commutation Act. Indeed, there is only one thing that can be safely prophesied concerning the staff of life, and that is that it will always be duly appreciated, and that there will never be too much of it.

Proceedings of Societies.

GEOGRAPHICAL SOCIETY.

Nov. 10th.—Right Hon. the Earl of Northbrook, President, in the chair.—The following gentlemen were elected Fellows:—Sir G. Kellner, Lieut. E. W. Petley, Rev. W. Parkes, Rev. J. Sibree, Messrs. A. Dilinege, W. J. Jeffery, and R. H. Michell. The papers read were "Opening Address," by the Earl of Northbrook; and "The Dutch Expedition to Central Sumatra," by Prof. P. J. Veth.

GEOLOGICAL SOCIETY.

Nov. 5th.—H. C. Sorby, Esq., President, in the chair.—Mr. H. B. Armstrong was elected a Fellow. The following communications were read:—"On the probable Temperature of the Primordial Ocean of our Globe," by Mr. R. Mallet; "On the Fish Remains found in the Cannel Coal in the Middle Coal-Measures of the West Riding of Yorkshire, with the Description of some new Species," by Mr. J. W. Davis; and "On the Skull of *Argillornis longipennis*, Owen," by Prof. R. Owen.

ARCHÆOLOGICAL INSTITUTE.

Nov. 6th.—Rev. C. W. Bingham in the chair.—The Chairman spoke of the great success of the meeting of the Institute at Taunton. The Rev. R. Bellis read a paper "On some Mural Paintings lately discovered in the church of St. Clement, Jersey." In connection with the subject of "Les trois Vifs et les trois Morts," the following inscription was found:—

"Hélas saincte Marie et quesse
Cestroys mors qui t'os cy hideulx
M'ont fait me pl're en g'de tri'tesse
De les vays ainxi piteulx."

Mr. W. Burges read a paper on the reliquiary at Orvieto. Concerning the execution of the remarkable enamels which decorate this reliquary there has long been doubt. owing to a mistake in Agincourt's "History of Art," where it is stated that the subjects of the enamels are "peints sur fond d'émail." The reliquiary was only exhibited twice in the year, and was kept under four keys in the hands of different functionaries, so such inquirers as Sommeran, Labarte, and Duran were, from various causes, unable to solve the question. Mr. Burges was enabled, in April last, to examine the enamels and to satisfy himself that they are executed in the ordinary manner, as described by Cellini, and not after the fashion of late enamel work, as stated by Agincourt. Mr. W. A. Sanford exhibited a bronze torque, a bracelet, a double-looped and double-socketed celt, found in the parish of West Buckland, Somerset. Mr. W. D. Jeremy sent some embroidery in bead-work, representing Charles II. and his queen. Mr. Buckley exhibited three chasubles and a dalmatic; Captain E. Hoare, a MS. in pencil, said to be of the time of the Irish civil wars. Mr. T. Marlow laid before the meeting an illuminated pedigree of the family of Mereland, anciently of Orchardleigh, Somerset.

LINNEAN SOCIETY.

Nov. 6th.—Prof. Allman, President, in the chair.—Mr. W. H. Twelvetrees was elected a Fellow. The President, in opening the session, briefly alluded to the demise of Mr. W. W. Saunders and Mr. J. Miers, whose scientific and official labours in connection with the society have been appreciated. Mr. W. T. Thiselton Dyer exhibited and made remarks on some photographs of vegetation, including *Cinchona Ledgeriana*, in the botanic garden of Buitenzorg, Java. Mr. D. Morris, lately returned from investigating the coffee-leaf disease of Ceylon and South India, read a paper "On the Structure and Habits of *Hemileia vastatrix*." He supports the Rev. R. Abbay's statements as to the destructive character of the fungus and its evident gradual extension over the coffee-producing regions of the East; he even expresses fears of its introduction to Brazil and the West Indies. The spores have previously been described as attached to the inner surface of the orange-coloured sporanges, a notion opposed to the received ideas of free cell formation, but the author believes them free within the sporangium. Mr. Morris explains the puzzling dark-brown bodies beneath the sporanges as composed of closely-interwoven threads of mycelium. During the south-west monsoons both bark and leaves are everywhere covered exteriorly by filamentous threads, which reproduce by germinating spores. In the wet weather these do not enter the stomata. It is in this stage before penetration that remedial agents, dusting of sulphur, lime, &c., have a chance of being effective, but a serious drawback is the vast area of infected abandoned crop, the diseased trees propagating the fungus. Dr. F. Day read a paper "On the Instincts and Emotions of Fishes." From many instances coming under his own experience and ample data of other writers, the author combats those who assert, as did Cuvier, that they are devoid of intelligence. Dr. Day shows they construct nests, transport their eggs, protect and defend their young, exhibit affection for each other, recognise human beings, can be tamed, manifest fear, anger, hatred, and revenge, utter sounds, hide from danger, betake themselves for protection to the bodies of other animals, occasionally leave the water for food, and different families often combine for attack and defence. Their faculties notwithstanding are greatly inferior to those of the higher races of vertebrates. The Rev. G. Henslow read a paper "On the Origin of the so-called Scorpioid Cyme."

CHEMICAL SOCIETY.

Nov. 6th.—Mr. Warren De La Rue, President, in the chair.—The following papers were read:—"On the Transformation Products of Starch," by Mr. C. O'Sullivan; "Note on the Formulæ of the Carbohydrates," by Dr. Armstrong; "On the Bromine Derivatives of β Naphthol," by Mr. A. J. Smith; "On the Dissociation of Ammonia Alum," by Mr. J. S. Thomson; "On a Methyl Oxysuccinic Acid, the Product of the Action of Anhydrous Hydrocyanic Acid upon Aceto-acetic Ether," by Mr. G. H. Morris; "On the Action of Phosgene on Ammonia," by Mr. H. J. H. Fenton; "On the Rehydration of Dehydrated Metallic Oxides," by Mr. C. F. Cross; and "On Alizarin Blue," by Mr. G. Auerbach.

PHYSICAL SOCIETY.

Nov. 8th.—Prof. W. G. Adams in the chair. The paper read was "On an Analogy between the Conductivity for Heat and the Induction Balance Effect of Copper-Tin Alloys, by Mr. W. C. Roberts.

ANTHROPOLOGICAL INSTITUTE.

Nov. 11th.—E. B. Tylor, Esq., President, in the chair.—The following new members were announced:—Baron A. von Hugel, Capt. R. C. Temple, Messrs. A. Tylor and G. W. Bloxam. Mr. E. W. Brabrook, Secretary to the Anthropometric Committee, exhibited two albums of photographs collected by that body. A "Report on the Bheel Tribes of the Vindhyon Range" was read by Col. Kincaid. The Bheels are very dirty in their habits; their principal diseases are enlarged spleen and smallpox. A paper was read by Mr. A. H. Keane "On the Relations of the Indo-Chinese and Inter-Oceanic Races and Languages," to show that Further India is occupied by two types —the fair and the yellow (Caucasian and Mongolian), the former speaking polysyllabic untoned, the latter monosyllabic toned languages; that both of these types, intermingled with the Papuan or dark races, constitute the whole of the population of the population of Malaysia; and that the Caucasian alone appears in the Eastern Pacific as the "Sawaiori" or "Large brown Polynesian race." The absence of the monosyllabic languages from the oceanic area was accounted for, the expression "Malayo-Polynesian" shown to be misleading, and the Malay type itself was considered to be not fundamentally but essentially mixed, the result of fusion in the Eastern Archipelago of the fair and yellow elements. Mr. S. E. Paul exhibited a collection of ethnoligical drawings made in Assam.

HISTORICAL SOCIETY.

Nov. 13th.—Annual Meeting.—The Report of the past year was read and approved. Seventeen ordinary members were admitted. An inaugural lecture was delivered by Dr. Zerffi "On the Science of History."

NEW SHAKESPEARE.

Nov. 14th.—Mr. Furnivall, Director, in the chair.—Four new members were announced. Dr. B. Nicholson read a paper "On Hebenon," contending that it was Spenser's and Marlowe's *heben*, L. *hebenum*, G. *eiben*, yew, whose seeds and juice, "taxi succus," were a known poison. Mr. F. Marshall argued that it was "henbane," that plant being taken for "hemlock," which produced the numbness and skin disease described by Hamlet's father. Mrs. Boole drew a parallel between the characters of Portia and Shylock, arguing that the lady's reverence for the letter of her father's law, and following it out to the ruin of her suitors, at whose sufferings she jeered, showed that she had much in common with Shylock. Mr. Furnivall disputed the theory that Essex was the Turtle of Shakespeare's "Phœnix and Turtle," showing what contradictions of fate it involved; and then read a longer paper on Puck's "swifter than the moon's sphere" and Shakespeares's astronomy, showing that the moon and the other planets were supposed to be fixed each in its own sphere, and that all were daily swung round the earth by the upper 8th sphere of the fixed stars, the firmament of Primum Mobile, above which was the empyreal heaven, the seat of God and the souls of the blessed.

CAMBRIDGE PHILOLOGICAL SOCIETY.

At the annual meeting in St. John's College, the Rev. Prof. Mayor, President, in the chair, the following officers were elected —Vice-President, W. A. Wright, Esq.; new members of the Council, Prof. Cowell, Rev. H. A. J. Munro, Rev. H. E. Maddock, Rev. S. S. Lewis, and Mr. C. E. Haskins; Secretary, Mr. Postgate; Treasurer, Mr. Sandys. The treasurer's accounts for 1878-79 were audited and approved. The following members were elected—Rev G. H. Sing and Mr. W. Ridgeway. Mr. Lewis called the attention of the society to the inscription VTERE . FELIX, painted in white letters, seven-eighths inch long, around a small black *olla*, which had been discovered at the beginning of last month in an ancient cemetery at Steeple Morden, in the county. Mr. Verrall offered remarks on Æschylus, Choeph. 935-972, &c.

ASTRONOMICAL SOCIETY.

Nov. 14.—Lord Lindsay, President, in the chair. Rev. J. L. Challis, Prof. J. J. Astrand, Messrs. W. C. Armstrong, T. W. Bithrey, G. H. Darwin, H. T. Vivian, and R. R. Webb, were elected Fellows. Prof. Adams read a paper "On the Ellipticity of Mars and its Effect on the Motion of the Satellites." Prof. A. Hall's observations showed that the planes of the orbits of both satellites are inclined at small angles to the plane of the planet's equator. Mr. Marth has in a recent number of the *Astronomische Nachrichten* investigated the motion of the nodes of the orbits of the satellites on the orbit of the planet, which will be due to the disturbing action of the Sun, and he concludes that, if there is no force depending on the internal structure of Mars which modifies the Sun's actions, the nodes of the orbits will be in opposition to each other a thousand years hence; but Prof. Adams pointed out that this motion would be materially affected by the disturbing force due to the ellipticity of the planet, which would cause the nodes of the satellites to retrograde on the plane of the planet's equator. The ellipticity of Mars is too small to be observed, but the motion of the nodes will probably afford a means of determining the ellipticity of the planet within very definite limits. A protuberance at the equator of Mars would also cause rapid motions of the apses of the orbits of the satellites, particularly of that of the inner one, and as this orbit appears from Prof. Hall's observations to have a sensible eccentricity, it will probably afford a still more exact means of determining the ellipticity of the planet. Mr. Marth mentioned that the observations made at the recent opposition appeared to show that the axis of the planet was not inclined at an angle of 27°, as had been hitherto supposed, but was probably inclined at an angle of only about 24°. In order to proceed with the investigation suggested by Prof. Adams, the position of the axis of the planet would need to be more satisfactorily determined. Mr. Stone read a paper "On the Evidence of a past Connection between four widely separated Southern Stars, viz., ζ Toucani, ϵ Eridani, ζ^1 Reticuli, and ζ^2 Reticuli," all of which possess large proper motions. There appears to be a common proper motion of the whole group amounting to more than $1''$ of arc, and though two of the stars are separated by a distance of 19°, it would seem that some 300,000 years ago they were all probably close together, and may have consisted originally of two systems of double stars with large proper motions like α Centauri. Dr. Schuster read a paper "On the Polarisation of the Corona." The President mentioned that he had obtained an observation of Deimos at Dunecht, and Mr. Common stated that he had on four or five nights obtained observations and measures of both the satellites of Mars with his 37 inch reflector. Observations of Deimos had also been obtained at Greenwich. Capt. Noble showed sketches of Jupiter with the great elliptical red marking in the southern hemisphere, which has recently attracted much attention.

ASIATIC SOCIETY.

Nov. 17.—Major-General Sir H. C. Rawlinson, President, in the chair. General W. W. Anderson, Liet.-Col. Lewin, Prof. F. W. Newman, Capt. St. Barbe Browne, Messrs. E. Arnold and S. Austin, were elected resident members; Col. S. A. Madden, Lieut. R. C. Temple, Messrs. C. Stephen, W. J. Addis, C. Rustomjee, W. Irvine, P. C. Wheeler, Babu Ramchundra Ghose, and W. Craig, were elected non-resident members. Papers were read by the President "On the Historical Value of the newly discovered Cylinder of Cyrus the Great," noticed in the *Athen.* for Nov. 8th, and by Mr. R. Sewell "On Hiouen Tsang and the Amravati Stupa." In the first, Sir H. C. Rawlinson showed that we have now an undoubted native record of the genealogy of Cyrus in the order—1. Achæmenes; 2. Teispes; 3. Cyrus; 4. Cambyses; 5. Cyrus the Great, as stated by Herodotus; and called attention to many curious matters relating to the religion then prevailing in Babylonia recorded on this monument. In the second, Mr. Sewell expressed his belief that Amravati, which is situated in a level plain, could not have been the spot visited and described by the Chinese pilgrim; on the other hand, that a place, seventeen miles from Amravati, now called Bézwada, corresponds accurately with his description. Mr. Sewell has recently excavated at Amravati some sculptures far more perfect than those from the same place now at South Kensington. It is hoped they may be sent to England.

MICROSCOPICAL SOCIETY.

Nov. 12.—Dr. Beale in the chair. Ten new Fellows were elected. Prof. Weismann and others were elected Hon. Fellows. A paper, by Mr. H. E. Forrest, "On the Anatomy of Leptodora hyalina," was read; also papers by Mr. J. Fullagar, "On a Supposed New Species of Fresh Water Freia," by Col. Woodward, "On Amplifiers and the Use of Chloride of Cadmium and Glycerine as a Fluid for Homogeneous Immersion;" and by Mr. J. Mayall, jun., on his immersion illuminator, which was exhibited to the meeting.

ROYAL INSTITUTION.

Nov. 3.—C. W. Siemens, Esq., D.C.L., V.P., in the chair. Major-General H. P. Goodenough and Mr. J. H. Sampson were elected members.

SOCIETY OF ENGINEERS.

Nov. 3.—Mr. R. P. Spice, president, in the chair. The paper read was by Mr. W. Jones, "On Modern Tramway Construction."

SOCIETY OF BIBLICAL ARCHÆOLOGY.

Nov. 4.—Dr. S. Birch, president, in the chair. A number of new members were elected. A communication sent from Mossul by Mr. H. Rassam, giving an account of his excavations in Assyria, &c., was read. The paper will be printed in a future part of the *Transactions*, with plans and drawings of the different sites excavated. A communication entitled "Le Décret de Phtah Totunen en faveur de Ramses II. et de Ramses III.,' by M. E. Naville, was read. In this paper M. Naville gave translations of two stelæ. The first, erected in the great temple of Abu Simbel, by Rameses II., recorded his victories in thirty-seven lines of hieroglyphics. The other stele was that erected by Rameses III. upon one of the pylons of the temple which he built to Ammon at Medinet Habou, and a copy of that erected by Rameses II. Dr. Oppert, who spoke at some length, referred to questions of chronology, and gave it as his opinion that, if the island of Bahrein were thoroughly explored, much light would be thrown on the lives of ancient kings and ancient dynasties. He also wished to correct a statement that had often been made before the Society, viz., that Egibi was a banker. Dr. Oppert contended that it was the name of a tribe, for which he gave his reasons, and stated that, if the cuneiform was to be read "son of Egibi," and so understood, Egibi must have lived upwards of two centuries.

INSTITUTION OF CIVIL ENGINEERS.

Nov. 11th.—Mr. W. H. Barlow, Vice-President, in the chair. The council had transferred Messrs. J. P. C. Anderson, T. A. Bulkley, R. Crawford, J. Jackson, J. T. Leather, R. K. MacBride, G. E. Ormiston, G. Palmer, F. F. Smith, J. Tate, F. A. Upcott, and A. F. Yarrow, to the class of memmers: and had admitted Messrs. T. Adams, H. W. Anderson, J. T. P. Bassett, E. S. Baylis, H. C. Bowdage, T. Butler, A. H. Case, J. A. Dockray, F. H. Edminson, J. W. Fells, P. M. Gotto, P. Hammond, W. T. Holberton, J. H. Holmes, C. C. Horsley, A. J. Hudleston, H. J. Johnston, P. E. Keene, W. Kissack, J. B. Labatt, I. A. Lewin, R. McArthur, W. Maxwell, C. T. Merrick, G. E. N. Pauling, H. Roche, R. B. Rutherford, W. T. Skaife, J. R. Smith, P. Smith, J. S. B. Tarbotton, F. A. Target, G. R. Tyndall, and L. A. Wallace, as students.

AN IMPROVED NAVIGABLE BALLOON.

A balloon to discover the North Pole, &c., and return safely again to the vessel, ought to be constructed partly on the tried principle of M. Dupuy de Lome, and partly on the tried system of M. Sivel, viz.,—with trailropes and ovalscoops, &c., somewhat like a captive balloon on the sea. The following is a description of the improved navigable balloon:—The balloon must be elongated in shape, and placed horizontally above the car, and a smaller sized balloon is placed inside the large one, and the latter must have the best invented pumps, viz.—To compress the gas in the iron receivers that is pumped from the small balloon, &c., as this system will enable the æronaut to ascend or descend at any time. As the balloon would not require much ballast, the above plan is also an improvement on the Chinese system, said to be used many years ago in China. The said invention answered well for aerial travelling. In the next place great improvements ought to be made in the safety-valves. It would also be advisable to have an extra safety-valve, so that the balloon could not possibly burst. Another important part of this navigable balloon is the trail-ropes or guy-ropes, and the oval-scoops attached to the ropes. These scoops are made so as to fill with ice or snow. My plan is to have two ropes, and an additional length must be wrapped round the windlass cylinder in the balloon car. The ropes will give an additional strength to the windlass gas cylinder. Another important improvement is, to prevent the trail-ropes from snapping. Supposing that the oval-scoops should catch against any obstacle on the ground, &c. A pulley must be attached to the top hoop, near the centre of the elongated balloon, and a spiral spring fixed near to the above pulley; the rope will then pass through a second pulley from a long rod down to the oval-scoops, &c. The above, with other suitable mechanism, will prevent a sudden snap of the ropes. Or if scientific opinion should disapprove of the large oval-scoops, &c., an improvement can be made, viz., by attaching a number of smaller oval-scoops on to a double trail-rope at intervals apart, on the everlasting bucket principle. Another important improvement must also be made in the double trail-ropes, viz., by coiling strong elastic bands round the rope at intervals. The trail-ropes cannot so easily break then, because the rope will be elastic. The windlass could be used also for a compressed gasholder. The gas must have flexible tubing, &c., to connect the balloon with the pumps, viz., to pump the gas from the inner balloon. The guy-ropes and oval-scoops, will be a valuable aid to the propellers and steerer, for the balloon will be at a given distance from the earth; therefore the steerer, &c., will have a more powerful effect; or, if the æronaut desires, he can set the balloon free by unwinding the double rope, as the oval-scoops will then be empty. Next, when the oval-scoops are wanted for use again, the gas can be pumped from the inner balloon into the windlass cylinder, &c., and with the help of the propellers, or by the use of aeroplanes, the balloon could be made to descend gradually until the scoops touch the ground, the oval-scoops being again full of ice or snow, &c. If the æronaut makes use of the windlass he can descend to the earth, or at any time ascend and continue the journey in the upper currents of air. The trail-ropes, &c., will greatly help the propellers and steerer, viz., to steer the balloon at a much greater deviation from the direct set of the wind than otherwise, as the above elongated balloon would then be able to tack about like a ship at sea. Next, the propellers are made with double blades. The blades open one way and close in the opposite direction, thereby presenting the edge of the blades to the wind; the double blades, when open, will strike the air with a much greater force than any aerial screw propeller. By a simple mechanical movement, the blades can instantly be made to strike with open blades in any direction, either for lifting or driving. The rudder might be made on the triangular sail principle, or the two-bladed aerial screw would answer better than the before-named. The propellers and the steerer ought to be attached to a long pole and placed high up under the elongated balloon, and secured by two long bolts and nuts, &c. The bolts hold the above to the hoop, so by pulling out the two bolts, the steerer and propellers can be dropped on to the ground—*i.e.*, when the balloon is falling. In the next place, the motive power to drive the machinery might be manual power, or perhaps a more suitable motive power could be found in some of the mechanical exhibitions or museums in England or America, &c. Or the same could be used in addition to the manual power. The latter power might be constructed on the principle of the lathe or velocipede, viz., with flywheel and crank, and treadles, &c. The saddles and treadles must be put to at a certain distance apart to allow the weight of the legs to act on the treadles, and two or four men could work the above together, and others might take their places alternately. The car must be a combination of lifeboat, with cabins, &c., and sledge. The sledge must also have several curved steel and wood runners, also hoops made of cane or hickory, or some other elastic material; the latter must be placed around the car and sledge. The hoops, &c., will be a protection against a sudden collision against ice hammocks, &c., or a sudden bump on the ground. Another essential thing to have is an improved pilot balloon. The following is a description of the improved pilot balloons. First:—The pilots are to be constructed as follows—viz. Two balloons, one placed underneath the other, the upper balloon to be pear-shaped, and the lower one to be made so to open and close on the same principle as a pair of circular bellows. The balloons must also be joined by the two necks, and four elastic bands placed lengthwise on the side of the lower balloon. Therefore the latter cannot inflate until the pilots ascend to a certain altitude. The envelope could be made of silk, and partly covered over with some shiny material. This will give the pilots a bright and silvery appearance, as the latter could then be seen at a greater distance, either on land or sea. The improved safety-valves, and the before-named system, will keep up in the air for a long time, and would no doubt travel hundreds of miles. The above system can be used also as a captive pilot, viz., with a cord tied to the large navigable balloon from the pilots. The Chinese used several pilots, viz., to warn the æronauts of the whereabouts of the cross currents in time to get out of any that would take them in a contrary direction. The pilots would act in any direction, either above or below the ærostat. With regard to the successful navigation of balloons, it is most important to ascertain how many varying currents and changes of direction there might be. Captain Templer, the æronaut, found that there existed in various directions in England three currents of air, one at 5,000 feet elevation, and another current was generally found at about 1,100 feet high, &c. The before-named æronaut believes that the several currents of air can be utilised by navigable balloons, viz., to steer to and return from one place to another. A great advancement has lately been made in ballooning by Captain Elsdale, of the Royal Engineers, who has made five ascents on consecutive days; and on one occasion, after some experiments with pilot balloons, he set out from Woolwich with the expressed intention of visiting his brother at Colchester; and by working three currents succeeded in alighting at that town about half an hour afterwards. This looks very promising for the future, for Captain Elsdale's balloon had not the powerful propellers described in this paper, nor even the proper shaped balloon; as this is one more proof what can be done with the latter improvements. With regard to the discovery of the North Pole by the before-named system of navigable balloons, it would certainly be advisable to have two instead of one balloon. One might be sent up and the second one kept back for a short time. So supposing that the first balloon should not return in a given time, the second one might be sent in search of the former. But before the first navigable balloon is started on its Polar journey the following precaution must be taken, viz., to make use of the storm barometer and other improved instruments, the same kind that are utilised in the American and English Meteorological offices for the weather forecasts. Next, the currents of air having been found in the right direction, a pilot balloon must be then sent up, and a second one after a short interval; and then the navigable balloon might be started for the Pole. In the next place, if the latter balloon should happen to enter a contrary current of air at any time during the journey, the before-named powerful propellers and steerer, &c., would steer the balloon back again within a safe distance from the ship, or, with the help of the trail-rope and grapnel, the balloon could be stopped during the journey from proceeding further in a wrong direction; or, if it be true, as some authorities state, that calm weather very often happens in the Arctic Circle, the weather forecast instrument should foretell calm weather, a second Polar voyage could then be made, as the before-named balloon (with the help of the powerful propellers, &c.) would be more sure of reaching the Pole, and bringing back the balloon, &c., again safely to the ship. Nextly, to convince all who take an interest in balloon steering, it is necessary to prove the superiority of the navigable balloon over the common balloon, by data. As the common balloon is like a ship without a rudder, so I must refer readers to the successful balloon experiments of M. Sivel and M. de Lome. The latter experiment not only proves that elongated balloons have been successfully steered at a deviation from the set of the wind, but it is also evident what can be done in future with an improved navigable balloon, like the one suggested by the writer.

SOME MODERN EXPLOSIVES.

At the late examination of the torpedo class at Newport the Board of Examiners spent some time in the building devoted to explosives. The reporter thought the interior appearance of the place was decidedly uncanny.

Ranged on a table were a hundred or more samples of the various explosives, as well as of their innocent ingredients—nitroglycerine of all ages, dynamite, fulminates carefully kept under water, picric powder, gun-cotton, and gunpowder—in many forms. The picrates of various substances shown were made at the station by Professor Hill and Lieutenant Commander Elmer, a student in the last class, and present a show of brilliant shades of colour. The picric powder is comparatively of recent date, and is intended to replace gunpowder in torpedoes. Professor Hill, who established its proportions and made it at the powder mill, thinks it fully as safe as gunpowder, not so easily affected by moisture, and of more than double force. It is composed of picrate of ammonium, potassium nitrate, and charcoal, and looks like coarse green tea.

Professor Hill conducted the examination. One of the most startling points of this programme was the free and easy manner in which the experts handled these wicked explosives. They were hammered, burned up, and let fall without an explosion, seeming to be perfectly harmless when properly made, until the proper means of firing was used, and then they go off with sudden and terrific violence. In fact, gunpowder was proved to be an infant in comparison, nitroglycerine being thirteen times stronger and exploding perfectly in water, the water pressure rather packing it and increasing its power. The explosive gelatine was shown to be a queer looking mess, in cakes about one inch in thickness, and appeared like innocent calves' foot jelly or soft glue. This was handled with perfect safety, is difficult to explode, and when set fire to it will burn up. A piece laid on a moderately hot stove will fizzle away like a slice of bacon. To explode it, a large fuse of fulminate of mercury was required. This was confined. A lump that had been blown to pieces by a weak fuse without exploding was simply shattered. When properly fired its force was enormous. The camphorated gelatine was shown to be particularly safe. It keeps well in a warm temperature, thus giving it an advantage over dynamite, which exudes in warm climates. This gelatine was made by adding to nitro-glycerine a small percentage of camphor and photographer's gun-cotton, previously dissolved in alcohol and ether. The whole is gently heated, when it becomes a pasty yellow cake, with a strong smell of camphor.

A NEW FISH WAY.

To provide a practicable passage for fish over dams or other obstructions, a current of water must be conducted from the upper level to the lower, with such velocity that fish may readily swim it, and under such conditions that they may readily find it.

Heretofore this has been accomplished in one of two ways. Either the total fall to be overcome has been broken into a succession of falls, connected by pools, as is common in the salmon ladders of Europe, or, second, the water is compelled to traverse a tortuous path down a flat incline—the tendency to increased velocity being controlled by the friction produced by the increased changes of direction.

The greatest slope allowable for dams of any height is about one foot in twelve, and the length of the water way being about three times the length of the incline, it follows that fish to overcome a fall of one foot, must swim a distance of thirty or forty feet, with continual changes of direction, and at every turn encountering baffling swirls or eddies.

In this fish way the water is delivered down a straight sluice way having an inclination of one in three; on either side the water is banked with a slight upward and inward impulse, while down the centre a current flows with uniform motion, being no faster at the foot of the way than it is at the top. The velocity of the central current may be regulated to four, three, or two miles an hour, as may be desired.

This way is built of timber, attached to a crib dam, and anchored to a rock bottom by means of iron rods. The intervening supports may be piles, stone cribs, or trestles. The builder will determine the best modes of securing according to the circumstances of the particular case. At the head of the way is a V shaped guard of timber, the lower edge of which is a few inches below the level of the crest of the dam. This will deflect the light floating material (sticks, leaves, &c.), and prevent any interference with the working of the way.

This fish way, when made in its simplest form, is a rectangular timber trough, two feet wide and two feet deep, inside dimensions. One end of the trough rests against the crest of the dam, the other in the pool below. The trough is firmly secured to the dam and to the bottom, and supported at intermediate points if necessary. Transverse cleats, three inches high, at intervals of twelve inches, are nailed to the bottom of the trough. The stringers rest upon the cleats, dividing the trough into three longitudinal compartments, the middle one being twelve inches wide, the lateral compartments being five and a half inches each. The stringers are one inch boards, ten or twelve inches, set on edge. The middle section of the way is divided by the inclined portions or buckets into a series of compartments. The lateral sections are similarly divided by partitions or buckets inclined in a reverse direction into a series of compartments, communicating below by the openings between the cleats with the corresponding middle compartments. The division of the lateral longitudinal compartments is completed by the series of directing plates. The water is brought into the way through a notch or sluice in the dam, two feet wide and six inches deep, and the interior hollow floor of the way is bevelled off level with the bottom of the sluice way through the dam. Shoulder blocks prevent the water from the dam overriding the lateral banked eddy water.

The water passing through the sluice from the dam tends to continually sink in the middle line of buckets and emerge at the sides at a lower level; the difference of head and the directing plates causes it to bank up on the sides and feed back to the middle of the way. The sinking in the middle is compensated in this way, and a constant depth and constant velocity is maintained from the top to the bottom of the way.

Mr. McDonald, the patentee of this way, claims that it delivers the water down a straight sluice, and under such conditions as closely to simulate the natural flow, and that the moderate velocity of descent offers no impediment to the ascent of the most sluggish fish. It may be built on a slope of one in three, or even greater, and it need not be wider than the water way, and does not require a great amount of material in its construction. It may be adapted to any water supply, and for a given capacity secures the greatest economy in the use of water. For our small streams, to pass alewives, &c., it may be roughly built of boards, with saw and hammer, at a low cost, or it may be expanded so as to throw the entire volume of a river through it.

From its compactness and lying so close under the dam, it possesses greater immunity from freshets, and can be protected with less cost than other ways..

This fish way the *Scientific American* (from which we have quoted the above) states has been adopted by the Board of Public Works of Virginia, and its erection made obligatory on all dams in the State. Mr. Marshall McDonald, of Lexington, Va., the patentee of the way, is the Fish Commissioner for the State of Virginia.

STEAM TOWING ON THE CANALS.—The extension of the Belgian cable towing system goes on rapidly in the Erie Canal. It is now complete to Rochester. The cost of towing by this system is reduced by one-half, and the time consumed two-thirds. One great advantage of this method of towing is that boats will take full loads west, instead of part loads as at present, while the saving of freights will give New York virtually a free canal. This at least is the opinion of the President of the Buffalo Board of Trade, Mr. Alonzo Richmond.

A NEW WRENCH.

THIS novel and useful tool, a description with illustration of which is given in our contemporary the *Scientific American*, is precisely the same in principle as Birch's well known watch key, and is manufactured in different sizes under patents by Messrs. J. S. Birch and Co., of New York city.

The jaws that grasp the corners of the nut or screw are tapered and placed on opposite sides of pin. Transverse slots at the upper end of the jaws receive L-shaped ends of the loop spring, which extends around another pin, in the follower. The latter slides easily in the upper end of the barrel, and is counterbored to receive the upper end of the spiral spring, the lower end of which rests on a shoulder near the middle of the barrel.

A small rod passes through the middle of the barrel to afford leverage for the hand of the operator. The jaws are operated by pressing down the follower, by grasping the wrench, and when the jaws are placed upon the nut or set screw, the follower is released and the spiral spring draws the jaws into the barrel, contracting them by the engagement of their tapering sides with the sides of the barrel, until the wrench fits the nut or screw to which it is applied.

This wrench adapts itself to nuts and screw heads of various forms, as well as different sizes. It is very convenient for picking up and applying nuts and set screws in inaccessible places, and is useful for holding and turning tools of various kinds, such as bits, drills, and reamers.

The smaller sized wrenches fit all sizes of nuts between 3-16ths and ½ inch, the medium size fits all sizes between ½ inch and 1¼ inch, and the larger size will fit all sizes from 1 to 2 inches.

Its capability of universal application makes it a desirable tool for the bench, and it is valuable as an accessory to printing, sewing, and other machines. Months of constant and severe usage have shown that this wrench has ample strength, and that it is practically incapable of wearing out. We are informed that one used in the factory of the manufacturers over two thousand times a day for more than a year shows very little wear and is perfectly good yet.

Further particulars may be obtained from Messrs. J. S. Birch and Co., 38, Dey-street, New York City.

TUNNEL OUTLETS FROM STORAGE RESERVOIRS.

BY MR. C. J. WOOD, M. Inst., C.E.

THE following is the abridgment of Mr. Wood's paper which was read at a recent meeting of the Institution of Civil Engineers:—

The subject was divided into the consideration of culverts in a direct line through an embankment, and tunnels round the end of the embankment as a distinct work. The author stated that the practice of laying pipes through an embankment, governed by valves at the foot of the outer slope, was reprehensible, and had been abandoned for a culvert of masonry or brickwork, in which the supply pipes were laid. This method was not satisfactory, first, because of the settlement of the earthwork; and, secondly, because of the subsidence of the puddle, both of which were likely to damage the culvert and create leakage. In crossing the puddle trench, a stone or brickwork pillar had sometimes been used to remedy this difficulty with partial success, and in other cases, a "slip joint" had been made of the portion of the culvert crossing the trench, to allow a slight vertical movement. In consequence, however, of the uncertain settlement of the earthwork of the sides of the embankment, this movement might not be vertical. The advantages of a culvert through the embankment were speed, economy, and the building of the culvert in daylight; these culverts were frequently surrounded by a coating of concrete, which gave additional security. The study of culverts under high railway embankments was suggested, and the author believed it best to leave the bank, if possible, intact, by an alternative method —that of driving a tunnel round or under the end of the embankment in the solid rock as a separate work, the tunnel to be lined with stone, brick, or cast iron segments backed with concrete. The objections to this plan were stated to consist in the work having to be done in comparative darkness, in the possible displacement of the natural strata of the ground, producing a creep of water outside the tunnel, and in the difficulty of backing the crown of the arch satisfactorily. The expense was in favour of the culvert directly through the embankment; the tunnel, though more costly, was safer, as it was not in the most dangerous place. The draw-off valves, placed in earlier examples at the foot of the outside slope, which prevented necessary repairs, were now frequetly at the bottom of a valve-pit built on the inside of the puddle trench in the embankment. These valve-pits were liable to get out of the perpendicular, and to prevent the valve-rods working; also the water went half way through the bank in the inner culvert. The draw-off valve was sometimes placed at the foot of the inner slope; it had a sloping face and was worked by rods up the inside slope. The drawbacks were that stones were apt to settle, that there was great thrust on the valve-rods, that there was a want of access to the valve in case of accident, and that the least cleanly water was drawn off. A culvert terminating in a valve-tower of masonry or iron was the best plan, the valves being in duplicate, one set inside, the other outside, the tower. The author advocated the tunnel clear of the embankment and valve-tower as the best and safest, if more costly, plan.

Some remarks followed on the works for the supply of water to Bradford, Yorkshire, which was obtained from three districts. A high level supply was taken from the hills above Oxenhope; an intermediate supply from Manywell Springs, and a low level supply from Skipton district. The high level reservoirs afforded instances of tunnel outlets. The Stubden Reservoir had been a cause of anxiety, the original culvert of masonry proving leaky. It had been abandoned in favour of a tunnel lined with cast-iron plates backed with concrete, terminating in a cast-iron valve-tower, erected from the design and under the superintendence of Mr. A. R. Binnie, M. Inst. C.E. The embankment was cut down, the original culvert taken out, and the embankment was then made up solid in thin layers, the new tunnel being used to run water off during the reconstruction of the work. No leakage of any description had since been noticed, the valve-tower and tunnel being water-tight.

The Leeming Compensation Reservoir for mill-owners had been originally made with a circular culvert having a slip joint and iron shield where it crossed the puddle trench. This culvert was seriously fractured by the subsidence of the bank, which was mostly on a clay foundation, and it was considered unsafe to fill the reservoir. On the suggestion of Mr. Rawlinson, C.B., M. Inst. C.E., and of Mr. Binnie, on the latter taking charge of the Bradford Corporation Water Works, the old culvert was abandoned, and a new tunnel was substituted, similar to the one at Stubden. The original culvert was afterwards filled on the inside with concrete, and the reservoir was successfully filled with water, no leakage or disturbance having occurred up to the present time.

In the case of the Leeshaw Reservoir,

which was in course of construction, on Mr. Rawlinson's inspection it was resolved to abandon the culvert already cracked, and to substitute a tunnel outlet and valve-tower of cast-iron, similar to those at Leeming and Stubden; this had been successfully done, the reservoir filled, and the work had since proved most satisfactory. In two of the above cases the culverts were so damaged as to be a strong argument in favour of tunnel outlets distinct from the embankment.

The remainder of the Paper explained the form and construction of the type of cast-iron tunnel outlet and valve-tower used in these works. The tunnels were mostly driven through Yorkshire grit and shale; they were 8 feet 6 inches high, 7 feet wide, and each tunnel had a fall of 1 foot in its length. The tunnel commenced at the bottom of a shaft, 13 or 14 feet deep inside the reservoirs, in which the lower part of the valve-tower, cased with concrete, was afterwards built. The valve-tower was composed of cast-iron rings with socket joints, caulked with iron borings and sal-ammoniac; on the top of the valve-tower, at the level of the top of the embankment, a house was built to protect the valves, and the tower was connected with the mainland by a light wrought-iron Warren-girder bridge on stone piers. The tunnel starting from the bottom of the valve-tower was elliptical in form, made in rings, each ring being composed of four segments bolted together and surrounded by concrete; it extended in a V-shape under one end of the embankment, and was a distinct work; at the angle of the tunnel an air-shaft was sunk, which was subsequently lined with cast-iron rings, and formed a ventilating pipe. The supply pipes, 2 feet in diameter, extended through the tunnel, and were jointed at the tower to a vertical stand-pipe, at equal intervals on which branches were cast and sluice-valves fixed. Connections to the pipes extended from the sluice-valves through the sides of the tower, and were further protected on the outside by flap-valves. Provision was also made for equalising the pressure on the flap-valves, and for the expulsion of air when opening one of the flap-valves. A wrought-iron ladder extended up the tower, and at intervals there were grated floors so as to afford access to the valves and working parts. The connection of the bottom of the tower with the tunnel was made with a cast-iron gland, to the face of which a wrought-iron bulkhead was screwed, so as to make the valve-tower water tight; the upper half of the bulkhead could be removed for entrance to that portion of the tunnel. These valve-towers had proved successful wherever erected. Mr. Binnie was the engineer for carrying out the works, the author being the resident engineer.

INSTITUTION OF CIVIL ENGINEERS

SUBJECTS FOR PAPERS—SESSION 1879-80.

THE Council of the Institution of Civil Engineers invite communications, of a complete and comprehensive character, on any of the subjects included in the following list, as well as on other analogous questions. For approved original communications, the Council will be prepared to award premiums, arising out of special funds bequeathed for the purpose, the particulars of which are as under :—

1. The Telfourd Fund, left "in trust, the interest to be expended in annual premiums, under the direction of the Council." This bequest (with accumulations of dividends) now produces about £260 annually.

2. The Manby Donation, of the value of about £10 a year, given "to form a fund for an annual premium or premiums for papers read at the meetings."

3. The Miller Fund, bequeathed by the testator "for the purpose of forming a fund for providing premiums or prizes for the students of the said institution, upon the principle of the 'Telford Fund.'" This fund (with accumulations of dividends) now realises £150 per annum. Out of this fund the Council have established a scholarship, called "The Miller Scholarship of the Institution of Civil Engineers," and are prepared to award one such scholarship, not exceeding £40 in value, each year, and tenable for three years.

4. The Howard Bequest, directed by the testator to be applied "for the purpose of presenting periodically a prize or medal to the author of a treatise on any of the uses or properties of iron, or to the inventor of some new and valuable process relating thereto, such author or inventor being a member, graduate, or associate of the said institution." The annual income amounts to rather more than £16. It has been arranged to award this prize every five years, commencing from 1877. The next award will therefore be made in 1882.

The Council will not in any case make an award unless a communication of adequate merit is received; but, on the other hand, more than one premium will be given, if there are several deserving memoirs on the same subject. In the adjudication of the premiums no distinction will be made between essays received from a member, an associate, or a student of the Institute (except in the cases of the Miller and Howard bequests, which are limited by the donors), or from any other person, whether a native or a foreigner.

LIST.

1. The Causes of Slips in Rocks and in different Earths, and the conditions that induce treacherous ground in railway-cuttings, tunnels, and the sides of valleys near reservoir-banks.

2. The most useful Sections of Rolled Iron for structural purposes, having regard to economy of material combined with strength.

3. The present system of making Steel for Railway purposes, and the properties and character of the material.

4. The Tempering of Steel, and the influence thereby produced on its strength.

5. Experiments on the Strength of Materials used in construction, with descriptions of the Testing Machinery employed to ascertain the same.

7. The various chemical and protective Solutions or Coatings for the surfaces of metal-work exposed to Corrosion, with instances of their use and durability.

7. The comparative effect of "dead" and "live" loads in straining materials and structures, with the factor of safety considered desirable for various proportions of such loads in different countries.

8. The Forms of Staging, Scaffolding, and Centreing used for the support of structures during erection.

10. The erection of large Bridges, with detailed descriptions of some of the more important examples of Rolling-over, Building out, Lifting bodily, &c.

11. The Design and Construction of a Steel Bridge, with particulars of the Weight and Cost, and of the tests to which it has been subjected, compared with an Iron Bridge of the same span.

12. The resistance to Traction of modern Vehicles on Modern roads.

13. The best system of working Suburban Passenger Traffic on Railways.

14. A description of the various kinds of Fireless Locomotives in use on Tramways, and their relation in cost to traction by horses.

15. The increase of Resistance on Railway Curves, and recent expedients to diminish the same by lubricated tires, divided axles, loose wheels, or otherwise.

16. The Construction of Masonry Dams for, and of Tunnel Outlets from, Storage reservoirs.

17. The Flow of Water through Pipes and Conduits, with experiments in verification of the existing formulæ, and suggested amendments and improvements.

18. The Mechanical Separation and Chemical Treatment of Sewage, with analyses of the effluents and of the sludge, and statements of cost in proportion to population and rateable value.

19. The modes of regulating the action of Storm Overflow from Sewers, and the Flushing of Sewers.

20. The methods used for determining the Discharge of Rivers, with a description of the Floats and Current Meters employed for the purpose.

21. The works carried out on the Continent of Europe for the Improvement of Rivers, and of Inland Navigation generally.

22. The apparatus and appliances for working under Water.

23. The relative cost of Excavating under different conditions by Mechanical Appliances and by Hand Labour, with descriptions of Dredging Machinery and Plant.

24. The design and construction of Building Slips for large vessels.

25. The construction of Tide Gauges, and the usual method of carrying out a systematic series of Tidal Observations.

26. The type of Steam Engine best adapted for ordinary factory purposes, in respect to economy in the use of steam, as well as in first cost, and in cost of maintenance.

27. The best method of testing Steam Engines (independent of their boilers), having regard to accuracy of the results, and ease with which the tests can be carried out.

28. The modern practice in the design and construction of Boilers.

29. The use of Compressed Air as a motive power, particularly as applied to machinery in mines, and for traction on tramways and in tunnels.

30. The relative advantages of Steam, Heated Air, Gas, Water, and Electricity as the motive power in small engines.

31. Wind and water as motive powers, compared with steam power, and the motors most suitable for utilising them.

32. The various descriptions of Pumps employed for raising Water or Sewage, and their relative efficiency.

33. The different systems of Lifts in use in warehouses and in dwellings.

34. Marine Engine progress, practically considered.

35. The special construction of Vessels for the reception of Railway Trains on deck, indicating the arrangements for the shipping of such trains on their own wheels at various states of the tide.

36. The most suitable appliances and arrangements for shipping Coal and other Mineral, both where the water level is fixed and where it is variable, and from waggons discharging from the end as well as from the bottom.

37. The relative Loss of Power due to friction in various parts of machinery.

38. The various classes of Lubricants, with records of experiments, showing their relative values, and a description of the mode of testing them.

39. The appliances and methods used in different countries for Tunnel-driving, Rock-boring, and Blasting, with details and cost of the results attained.

40. The methods and machinery employed in Sinking and Working deep Coal Mines.

41. Coal Depots for ocean steamers, the various points involved in their management, and the methods of preserving large quantities of coal from deterioration.

52. The methods employed in securing large and irregular-shaped mineral workings, for example, the Almaden Mines, the Great Comstock Lode, &c.

43. The combined use of Fire-brick, Iron, and other materials for resisting high tem-

ptures in Blast Furnace Kilns, Pottery
Gs, and similar structes.
. The disposal and ilisation of Slags
various smelting ocesses.
. The managent of Underground
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nomy of dist[illegible]ted or trunk pumping
ines, adits, [illegible] par[illegible] es.
[illegible] principles unde[illegible]ng the progress
Economy in Gas Production and Distribution, with recent methods of Purification.

47. On proportioning Mains for the distribution of Water and Gas.

48. The employment of the Electric Current for the Transmission of Sound, and the use of the Telephone for practical purposes.

INSTRUCTIONS FOR PREPARING COMMUNICATIONS.

The essays should be written in the third person, and be legibly transcribed on foolscap paper, on one side only, leaving a margin on the left side, in order that the sheets may be bound. Every paper must be prefaced by a concise abstract.

Illustrations, when necessary, should be drawn on tracing paper. to as small a scale as is consistent with distinctness, and ready to be engraved. When an illustrated communication is accepted for reading, a series of di[illegible] will be required sufficiently [illegible] coloured to be clearly [illegible] 60 feet. These dia[illegible] be returned.

[illegible]pers which have been read at the meetings of other societies, or have been published in any form, cannot be read at a meeting of the Institution, nor be admitted to competition for the premiums.

The communications must be forwarded to the Secretary of the Institution, from whom any further information may be obtained.

CHAS. MANBY, Hon. Sec.
JAMES FORREST, Secretary.

Every paper, map, plan, drawing, or model, presented to the Institution, shall be considered the property thereof, unless there [illegible] been some previous arrangement [illegible]y.

The Council emphatically repeat that the Institution must not, as a body, be considered responsible for the facts and opinions advanced in the papers or in the consequent discussions, even though such papers may have medals and premiums awarded to them, on account of the science, talent, or industry displayed in the consideration of the subject, and for the good which may be expected to result faom the discussion and the inquiry.

SONG OF THE NYMPHS WITH DIANA.

Oh! we hunt by the rising moon's pale
    light,
  And away to the forest shade!
We follow the deer to their haunts at night
  With Diana the huntress-maid.
And as sure as the bow she gently bends,
As true are the arrows she swiftly sends!

Ah! fleet as the deer's are her tiny feet
  As she follows in artless guise;
And supple, and fair are her limbs so sweet,
  And so mellow her dark blue eyes:
That the sylphs, who sport in the midnight
    air,
Strive in vain to vie with the maiden fair!

We steal down the slopes of the mountain's
    side,
  To the drink of the gentle deer;
Where the waters meet with the swollen
    tide,
  Or sleep deep in the lakes so clear.
Far, down to the sea, by the foaming waves,
Where the syrens sing in their coral caves!

HENRY GEORGE HELLON.

IMPROVED ARMOUR-CLAD SHIPS.

THE patent of Sir Henry de Burgh Lawson, Bart., of Gatherley Castle, Richmond, Yorkshire, for improvements in the construction and propulsion of armour-clad ships, merits the attention which it is understood to be receiving at the hands of the Lords of the Admiralty. The improvement consists in constructing ships with three keels, between which their bottoms are curved in combination with special internal propellers, worked and housed in chambers from which the water is partially excluded, each propeller having a separate set of machinery, working independently of each other.

In addition, the hulls are proposed to be made in a series of air-tight divisions, and the smoke and steam delivered from the boilers into the water. By the system of keels and curves, &c., the rolling of the vessel will be much lessened and almost prevented, and her stability assured. The propellers will cause the vessel to be easily managed, quickly turned or stopped, and all seamanlike manœuvres quickly and certainly effected. The fitting of the air-tight compartments, and under the decks, &c., with cork, &c., will prevent the sinking of the vessel, and make her almost indestructible. The materials to be used are steel, iron, patent compressed paper, cork, gutta percha, indiarubber, &c.

According to the specification, sealed in 1878; Sir Henry proposes to work his special propellers between the keels in and under the bottom of the ship and housed in diving bell like chambers, where the waters are of the greatest density, and therefore of the greatest resistance and propelling power, so that the propellers will lift the vessel, as well as propel her at great speed, causing the ship to face and be under control in any weather and safe in any sea.

The Lords of the Admiralty have retained the plans for official reference, and should the patent be adopted by Government, iron-clads so constructed will be the means of saving the lives of thousands of our fellow-creatures, as it appears they will neither upset nor sink, even if riddled by shot. They will carry guns of the longest callibre, be of great speed, under perfect control, and will turn in their own length as if on a pivot. Doubtless this patent will revolutionise the whole of our iron-clad navy.

PRITCHETT'S ECONOMIC APPLIANCES FOR WARMING AIR.

THIS apparatus is constructed to illustrate practically how easily a mass of air may be warmed by a very small expenditure of fuel. Metal cases are used and are fitted one within another in rectilinear form, and contain so small a quantity of water that two of them can be well heated by one common gas jet when mixed with atmospheric air and consuming about five feet of gas only per hour, or they may be heated by any any other means. The cases alluded to may be placed (when enclosed or open) in any convenient spot, under the windows in a room for instance, or around an invalid's chair.

Fresh air can be admitted through the centre of these cases; whilst the air in a room will be warmed by the outer surface of the cases, thus external and internal air can be warmed at will. The vitiated air of an apartment can be carried off by efflux cases, which may be fixed where required and heated by hot water as the other cases are. The top of these cases are formed into evaporating pans, and the vapour from these may be usefully applied in cases of illness. The apparatus can also be brought into operation by an ordinary fire; the little reservoir or kettle in this case may be formed into a "cheek" and fitted into a fire-place; or the kettle may be placed on the fire, whilst the flow and return pipes can be easily dealt with so as to be out of the way.

Where an ordinary fire-place is used there will be no extra cost for fuel; and in instances where the little boiler is formed into a "cheek," to fit into the fire-place less fuel will be used, whilst the large surface of the case is quickly heated by a few quarts of water.

The arrangement alluded to is true economy, especially when it is considered that the apparatus can be placed in such a position in a room or conservatory, so as to give warmth where it is most required; and plumber's work is well nigh dispensed with.

Certificate of merit was granted to Mr. Pritchett at the recent Croydon Exhibition.

AN ELECTRIC LAMP FOR AN ENGLISH SHILLING.

A RECENT number of the *Scientific American* refers to the above in the following terms:—

Blazoned in brilliant colours on a box cover in a show window is a representation of a miniature electric lamp, below which are these words, "Real Electric Light. Price 1s. This wonderful lamp will produce instantaneously an electric light of great steadiness and power. Its action being automatic, it requires no attention, and will burn for hours, costing a trifle only above gas. It is adjusted readily for immediate use, and is so simple that a child can work it." The box contains a little lamp, and all that is said in regard to it is undoubtedly true, providing the lamp is furnished with a sufficiently strong and constant electric current; but to generate the required current cheaply and conveniently will probably trouble our youthful experimenters, as it has the older heads for a half century. In fact we think a battery capable of running the lamp for any considerable length of time can hardly be made for less than 25 dols.

Directions are furnished for making a battery; but a little experience in this direction will soon make plain the unpleasant fact that a strong and steady current cannot easily be maintained by the use of batteries. It will be found that a great deal of electric energy will be required to maintain a single lamp, even a toy lamp. A boy with one of these lamps is in about as good a position, so far as the question of general electric lighting is concerned, as the most experienced in these matters.

The lamp costs 75 cents. of our money, and any boy can make it. From the base project a brass tube, and a carbon cylinder. These are each provided with a wire which projects from the base to be connected with the electrodes of a battery. A wire fits loosely in the brass tube, and a curved tube is soldered to its upper end. A slender carbon pencil is inserted in the curved tube, and rests upon the carbon cylinder. The whole is covered with a glass shade. When the current is allowed to pass through the lamp the light will appear at the juncture of the carbons.

RELATIVE ECONOMY IN STEAM AND GAS ENGINES.—According to Mr. J. T. Sprague, some of the improved gas engines now in use of small capacity realise 1-horse power on the gas derived from 1 3-5 lb. coal; and the best steam engines of large capacity realise 1-horse power on 2½ lb. coal. Gas engines are thus shown to be much more economical as motors than steam engines.

Mr. Robert MacKellar, of Peckskill, N. Y., has invented an improvement in fire-grates for burning soft and hard coal. It is so constructed that the coal can be easily stirred and kept looose and free from ashes so as to burn freely. It consists in the combination of the screw with a grate having a slot formed through its centre, the screw forming the middle portion of the grate.

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The various efforts which have been made, and the numerous influences now at work to injure, if not destroy, Patent Rights; many well-intended, but ill-considered, Schemes of Patent Law Reform, which have from time to time been suggested, and the tendency of which generally been to prejudice the Inventor without advantage to the Public; together with the proceedings so essentially involving the interests of Inventors which have already taken place in Parliament, as to the propriety of abolishing Patent Rights altogether, show the necessity of an immediate and active co-operation on the part of those interested in Inventions and in Patent Property, and that an Association for the Protection and Defence of Patent Rights is urgently needed. This Institute has, therefore, been established for the purpose of uniting and organising the influence of Inventors, Patentees, and others. Its objects are:—

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